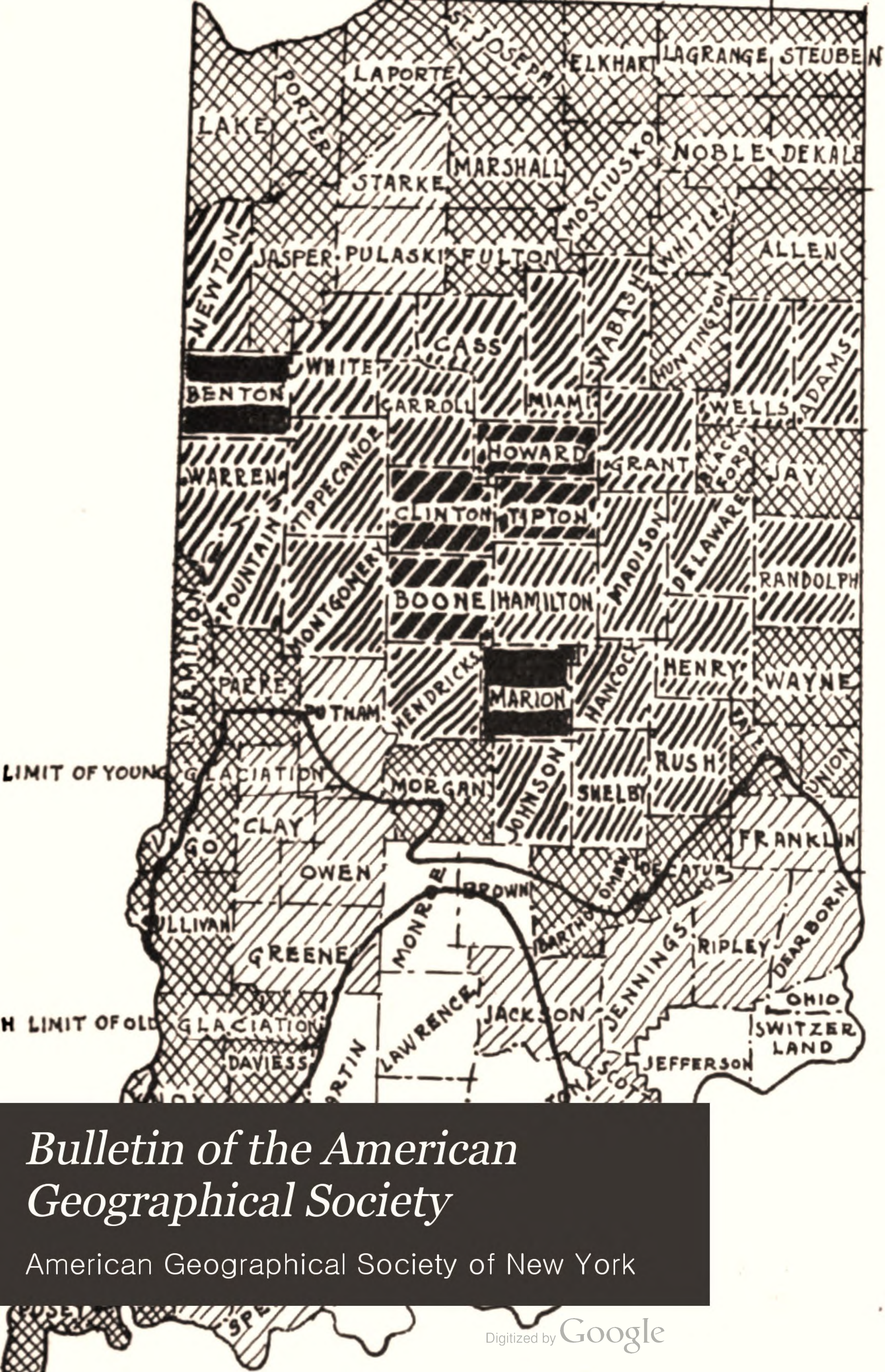

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American Geographical Society of New York

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OF THE

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1914

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AMERICAN GEOGRAPHICAL SOCIETY.

OFFICERS AND COUNCILLORS,

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BULLETIN

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AMERICAN GEOGRAPHICAL SOCIETY

VOL. XLVI | 1914 | No. 1

NOTES ON THE SOURCES OF THE PEACE RIVER, BRITISH COLUMBIA

By FREDERICK K. VREELAND

(Map facing p. 24)

On the official government maps of British Columbia there are considerable areas of blank white paper surrounding the head waters of the Mackenzie River. The principal tributaries of the Mackenzie from the west, namely the Liard, the Peace and the Athabaska Rivers have their source in a rugged pile of mountains which constitute the northern end of the backbone of the Rockies. Of these three tributaries, the Peace River is particularly interesting, because it performs the noteworthy feat of rising on the western side of the mountains in a great trough-like valley, whence it makes its escape by cutting a deep gorge clean across the range, through which it flows eastward to the great plateau.

This extraordinary work of nature was discovered and described by Alexander Mackenzie on his historic journey across the continent to the Pacific, in 1792-3[1]. Selwyn followed in 1875[2]; and Dawson in 1879 mapped the valleys of the Parsnip and Peace Rivers[3]. On Dawson's map appears the notation "rugged mountains tipped with snow in August"; and he made a reconnaissance into the more accessible portion of the range, traversing the Pine River Pass, south of the Peace River.

In later years McConnell[4] and Robertson[5], Canadian geologists,

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[1] Alexander Mackenzie: "Voyages ———." London, 1801.

[2] Alfred R. C. Selwyn: Report on Explorations in British Columbia, *Report of Progress, Geol. Surv. of Canada, 1875-6.*

[3] George M. Dawson: Report on an Exploration from Port Simpson on the Pacific Coast to Edmonton on the Saskatchewan, Embracing a Portion of the Northern Part of British Columbia and the Peace River Country, *Report of Progress, Geol. Surv. of Canada, 1879-80.*

[4] R. G. McConnell: Report on an Exploration of the Finlay and Omineca Rivers, *Annual Report, Geol. Surv. of Canada, Vol. VII, 1894.*

[5] Wm. Fleet Robertson: Essington to Edmonton, *Report of Minister of Mines of British Columbia, 1906*, pp. 101-131.

have explored the Peace River and its principal tributaries, making geological studies of the valleys and adjacent mountain slopes; but little has been done in the mountains. The range is so rugged that travel is difficult, and, because of the remoteness of the region, a summer season is all too short for a serious exploration. E. A. Preble of the U. S. Biological Survey traveled overland from Telegraph Creek to Fort Grahame in 1910, with the intention of crossing Laurier Pass, but was forced by the lateness of the season to give up that part of the trip and descend the Finlay and Peace Rivers.

In 1912 the new transcontinental railroad reached the head of

Fig. 1—The eastern approach to Yellowhead Pass follows a gradual slope in the valley of the Athabaska and Miette.

navigation on the Fraser River, which approaches the southern source of the Peace River, thus opening an easier approach by water. Grasping this opportunity, I undertook, with Mr. W. F. Patterson of New York, to study that part of the range which lies north of the Peace River, in the vicinity of Laurier Pass. The objects of the trip were mainly biological. This region was chosen particularly in the hope of throwing light on the problem of the mountain sheep and of determining, if possible, whether the northern "black sheep" (*Ovis Stonei*) is consistently distinct from its more southern neighbor, the "bighorn" (*Ovis Canadensis*), or whether the two species intergrade.

With a commission from the U. S. Biological Survey to collect specimens for the National Museum and a permit kindly furnished by the Provincial Museum of British Columbia authorizing this

work, our hands were more than full; hence the opportunities for geographical work were limited. We did, however, take such simple observations as were necessary to plot our route with a fair degree of approximation and to locate the principal mountain peaks by cross bearings (see footnotes 8 and 9). The results are shown on the attached map.[6]

Itinerary. The route chosen to reach these mountains was as follows: Leaving Edmonton, Alberta, we proceeded westward by

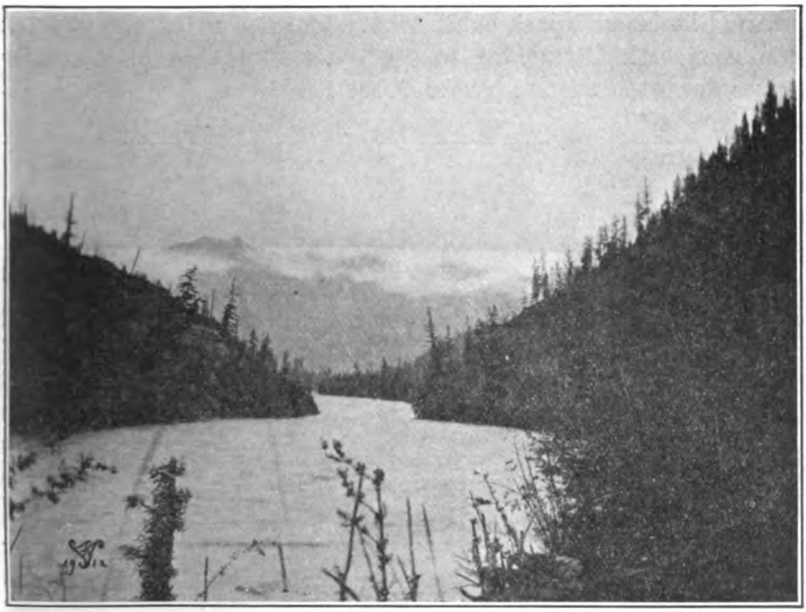

FIG. 2—The Fraser River 47 miles from the summit of Yellowhead Pass, just before it emerges from the steep water-cut valley into the great preglacial trough, which is seen in the distance. Looking west.

the new Grand Trunk Pacific Railroad[7] as far as the end of the steel, twenty-eight miles beyond Yellowhead Pass. From Mile 28 on the railroad our outfit was hauled twenty miles by wagon down

6 Besides the author's observations the following sources were used in the compilation of the map:

Dawson: Map of Northern British Columbia and the Peace River Country, 1:506,880. Sheet II. *Rept. Geol. Surv. Canada, 1879–80.*

McConnell: Map of Finlay and Omineca Rivers, B.C., 1:506,880. *ibid.*, N. S., Vol. VII, 1894.

Lafferty and Tobin: Map Showing Route from Edmonton to Yukon River as followed by a Party of North-West Mounted Police under command of Insp. J. D. Moodie. 1:675,840. *Rept. North-West Mounted Police, 1898.*

Map of Peace River Block, 1:506,880. Accompanies "Description of Surveyed Townships in the Peace River District." Topogr. Surveys Branch, Ottawa, 1913.

Pre-Emptor's Map: Peace River Sheet, 1:253,880. B. C. Dept. of Lands, 1913.

7 We are indebted to the officials of this railroad for carrying our canoe and outfit on a construction train, and for marked courtesies and material assistance at the start of the journey.

the west side of the pass to Mile 48, five miles above Tête Jaune Cache. There the canoe was launched, July 13th, 1912, and we proceeded down the Fraser River to the point where it turns south, above Fort George. Here the Giscome Portage brought us to Summit Lake, the southernmost source of the Peace River. Then we followed the Crooked, Pack and Parsnip Rivers northward to the junction of the Parsnip and Finlay, forming the Peace River, which was followed through the gorge above mentioned to the Mountain-of-Rocks Portage above Hudson's Hope. Here we secured horses and pack outfit for the journey in the mountains to the northwest. Returning to Hudson's Hope, we proceeded by canoe down the Peace River to Peace River Crossing, thence over-

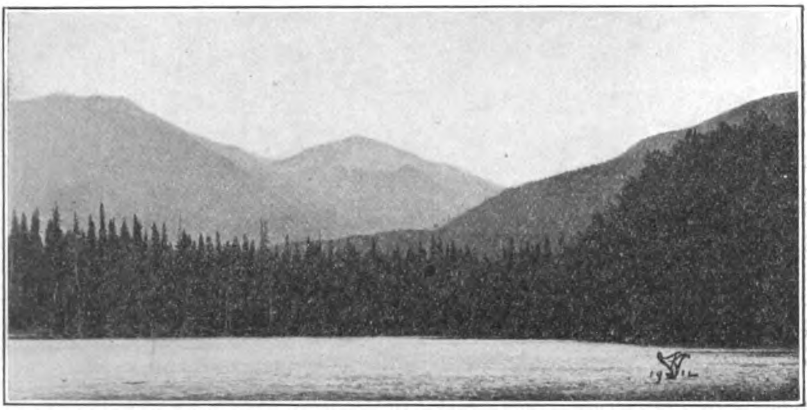

FIG. 3—A break in the southwest wall of the trough, showing high mountains near the source of Castle Creek.

land to Lesser Slave Lake, then down the Slave and Athabaska Rivers to Athabaska Landing, which point had just been reached by a new railroad. The entire circuit from railroad to railroad is approximately fourteen hundred miles, and the trip occupied three months' time.

The Fraser River. A noteworthy feature of the Rocky Mountain region in British Columbia is the broad trough which follows the mountain range, and in which flows a succession of rivers, some northwesterly and some southeasterly. This trough was evidently the bed of a great river in preglacial times, but the subsequent accumulations of morainic material have divided it into half a dozen different watersheds. South of the Yellowhead Pass the trough is occupied by the Canoe River, flowing southeast into the Columbia

River, which it meets, coming in the opposite direction, at the Big Bend. North of Yellowhead Pass it is occupied by a small tributary of the Fraser, and finally by the Fraser River itself, flowing north-west. The principal source of the Fraser, however, rises near the summit of the pass and plunges through a narrow water-cut valley, passing near the base of Mt. Robson, the highest known peak in Canada (13,700 feet), and finally flowing out into the pre-glacial trough at Tête Jaune Cache (Fig. 2).

The descent from Yellowhead Pass to the great trough is steep and rugged, in marked contrast with the gradual approach to the pass from the east by a broad, open valley (Fig. 1). From Mile

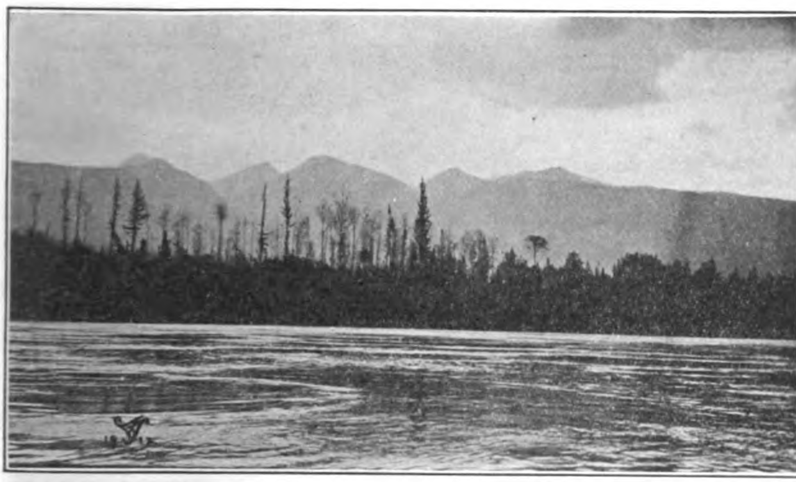

Fig. 4—The Fraser River below Castle Creek looking southwest across the level bottom of the great trough to the wall of the mountains. The foreground is recently burned.

28, below Moose Lake, to Mile 48, five miles above Tête Jaune Cache, the river drops about one thousand feet, through a series of rapids and cataracts which make canoe travel impracticable. Below Mile 48, the river is navigable for canoes, and, although turbulent and full of whirlpools, there is nothing of serious moment until the Goat Rapids are reached, below the mouth of Goat Creek. These may be run in safety at ordinary stages of the water. The next obstacle is at the "Grand Canyon." This is in two parts. The upper canyon proved impracticable for a heavily loaded canoe and was portaged, but the lower canyon was run without mishap, though a whirlpool forming unexpectedly caused some excitement.

Between Tête Jaune Cache and the Grand Canyon the river

follows a very tortuous course through the alluvial bottom of the great trough. The bottom is from three to five miles wide and is flanked by fairly high mountains, with rugged snow peaks visible through the gaps (Figs. 3 and 4). Through this bottom the river swings from side to side of the trough, cutting in places steep banks, sometimes fifty to one hundred feet or more high, of stratified rock-powder flaked with mica, in which thousands of bank swallows make their nests. The eroded material fills the river with a gray, glistening silt, and forms ever-shifting bars over which the river whirls and boils like a seething cauldron. As the river flows north and westward, the mountains become lower and recede until finally, at the canyon, they cease entirely on the southwest bank and continue

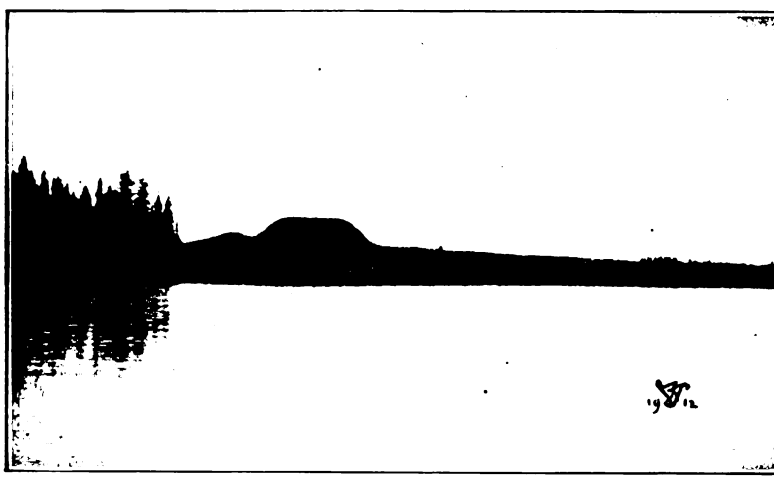

FIG. 5—Summit Lake looking northwest. The little knob (locally known as Teakettle Mountain), which marks the beginning of the Crooked River, is the only break visible on the surface of the interior plateau.

only a little farther on the northeast shore. At the canyon the alluvial bottom of the trough gives place to a rock ledge through which the river has cut a narrow gorge, finally emerging into a great area of wooded hills and bottom lands, which continue beyond the point where we left the river, at Giscome Portage. Here the river makes a great bend to the south and plunges into a series of rapids which obstruct navigation above Fort George.

The valley of the upper Fraser River is forested throughout. Great havoc, however, has been wrought by the railroad construction crews, who start fires to clear the right-of-way and allow them to spread over the whole mountain side. As far as the active work

has proceeded, these burnings are not the exception, but the rule, and the destruction of fine forest is appalling. I understand the fault lies mainly with the contractors, and that steps have been taken to check their depredations. This is highly desirable since the Fraser valley contains much very fine timber, and its burning means not only great pecuniary loss, but the ruining of a scenic route whose value would be immeasurably greater if it were not marred by blackened skeletons of trees.

Above Tête Jaune Cache and on the mountain sides the forests are mainly of spruce and lodgepole pine. In the river bottom there is a fine mixed forest (where not burned) of birches (*Betula papyrifera*), large cottonwoods (*Populus balsamifera*), aspens,

Fig. 6—The Crooked River winds and twists between boggy shores bordered by willows and alders.

spruces, some Douglas fir, balsam fir and cedar; alders growing to trees six and eight inches in diameter, and various willows. At the canyon we measured a cottonwood tree having a circumference of seventeen feet, breast high, and a spruce ten feet; at Goat Rapids a cedar sixteen feet, breast high. Below the Grand Canyon, as the mountains fall away, more aspens and birches appear, but there is also a good deal of fine spruce timber. Undergrowth, including the spiney "devil's club" (*Fatsia horrida*) is usually so dense as to discourage travel on foot.

The Crooked, Pack and Parsnip Rivers. At Giscome a seven mile portage leads over a ridge to Summit Lake, the source of the

Crooked River. This ridge, although only four hundred feet above the river, is nevertheless the divide between the Pacific watershed of the Fraser and the Arctic waters feeding the Peace River; and it marks a change in the aspect of the country quite incommensurate with its size.

Summit Lake (Fig. 5) is a placid body of clear, limpid water, in the midst of a broad plateau which extends as far as the eye can reach. The shores are flanked with dark spruces, and there is no landmark to break the severely level skyline but a little knob known as Teakettle Mountain, apparently of igneous rock, which guards the outlet of the lake and marks the beginning of the Crooked River.

The Crooked River (Fig. 6) is a little meandering stream which well earns its name as it wriggles on its erratic way; sometimes calm and placid, again plunging suddenly into a miniature rapid or spreading out over a gravel bed. At first the shores are boggy and bordered by willows and alders. The mountains are far away, and the occasional hills that break the monotony of the landscape are of gravel, or glacial detritus. As the hills grow higher they are covered with a fine coniferous growth—spruce, balsam fir and a few Douglas fir. In places there are gravel banks grown with lodgepole pines, many of which are conspicuously marked with scars made by the Indians, who strip the bark for the purpose of collecting sap for food in the spring.

At McLeod Lake a spruce-clad ridge appears on the east shore, and on the flat land below the lake the first cottonwoods observed on the Arctic watershed were found. These cottonwoods are of great importance to the few Sikanni Indians who inhabit the region, since they furnish the material for dugout canoes, which the Indians fashion with great skill. Some of these canoes are thirty to forty feet long and are remarkably light, considering the crude method of their construction. With their long, narrow form they are admirably adapted to poling upstream against the swift current of the rivers. Near the confluence of the Pack and Parsnip Rivers, the cottonwoods largely replace the spruce, growing on banks of gravel and sand in which streaks of lignite appear (Fig. 7).

The Parsnip River is much larger than the Pack (as the outlet of McLeod Lake is called) and the brown bog waters of the latter are soon engulfed in the stronger stream, whose green color indicates its origin in the snow mountains. Here, for the first time, high mountains become visible to the north and east.

This confluence is noteworthy from the fact that when Alexander Mackenzie reached this point, going up stream, he chose the east fork, or Parsnip River, instead of the west, or Pack River, which we followed. He was thus led into a rugged tangle of mountains and suffered much hardship which might have been avoided if he had happened to choose the lower and easier route.

Below this point, the Parsnip River is a strong, full stream, flowing with a swift, but a fairly uniform current through a rolling country. With its northward progress it approaches nearer to the eastern range of mountains, of which we caught occasional glimpses through the fog and low-hanging clouds which hung over the valley for several days.

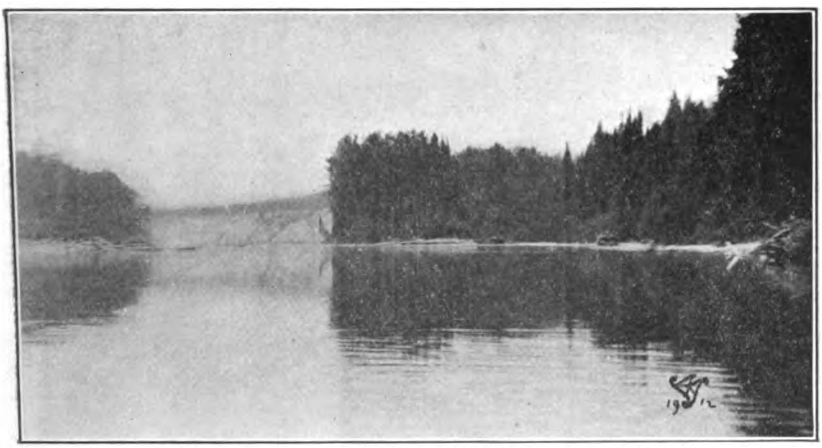

Fig. 7—Near the junction of the Pack and Parsnip Rivers, showing typical cottonwood growth on a gravel bar, and a cut bank beyond.

Three miles above the mouth of the Nation River, the first rock becomes visible in a limestone exposure, which has been sharply cut off by the river; and here we jumped into a series of vigorous rapids—not rough enough to be alarming, but very acceptable after the long stretches of shoal water obstructed by gravel bars, through which we had passed.

The river then pursues a somewhat meandering course, cutting its way frequently between steep banks which suggest those of the Fraser River, although here they are of coarse sand and gravel. The eroded material has been deposited in the river bed, forming numerous islands, some of them a mile or two long, which frequently divide the stream into several branches. These islands are continu-

ally shifting. In some places, no less than four distinct growths of cottonwoods of various ages mark the water lines of successive flood seasons. The river bed evidently has changed materially since Dawson's exploration, the main channel sometimes passing around an island where he shows only a narrow by-pass or even a peninsula, so that it is difficult to recognize the landmarks noted on his map. Consequently, we were quite taken by surprise when we met, almost head on, the strong current of the Finlay River, flowing down from the northwest through a broad valley flanked on both sides by mountains.

The two streams mingle in a boiling, tumbling rapid half a mile below their confluence, and even at this distance the roar of waters

Fig. 8—Mt. Selwyn from the Peace River below Finlay Rapids, looking S. 41° E. The river swings to the right, passing close to the precipitous north face of the mountains.

gives ample warning of trouble ahead. Thus the Peace River is formed.

Mt. Selwyn and the Upper Peace River. The body of the river flows to the south of an island in a smother of great swells. Close to the south bank, however, one may pick a channel by which a canoe can be let down in safety. In a light canoe this channel might have been run with care, but with our heavy load we considered it wiser to line the canoe down, especially as the river broadens out below the rapid in a huge eddy which might easily cause trouble. At high water this is doubtless a dangerous whirlpool.

Below the rapids the river sweeps on with a steady, majestic flow,

bearing us swiftly toward the gap in the mountains, which is guarded by Mt. Selwyn—a fine peak rising abruptly from the south bank of the river. A clear, cold stream drains the western slope of the mountain and at its mouth we beached our canoe and cached our outfit, well out of reach of inquisitive bears and porcupines, taking on our backs light packs with four days' provisions for a reconnaissance of Mt. Selwyn and its neighboring peaks.

Mt. Selwyn (Fig. 8) is the apex of a rugged escarpment running approximately northwest and southeast, very precipitous on the northeast side, where it drops off into a valley separating it from

Fig. 9—The Parle Pas Rapids, Peace River, showing the wooded bottom land and rounded hills on the south bank.

a broader chain of mountains farther east. On the southwest side the slope is more gradual and is cut into numerous glacial basins, feeding the stream before mentioned. There are three main peaks, the one next the river being the lowest and the third the highest—approximately 7,500 feet.

Climbing is rendered difficult by a tangle of down timber, resulting from a fire which swept the whole mountain side, apparently twenty years or more ago. This tangle is growing up with aspens

and lodgepole pines to an altitude of 4,500 feet, although the remains of the former spruce growth continue up to 5,200 feet.[8]

We intended to camp about tree-line, but we found that the snow on the southwest slope was all melted and the mass of quartz rock, of which the mountain is largely composed, afforded no water. Hence we were forced to descend to the western valley for the night. The next day, however, we found a glacial basin a mile or so farther south, containing a pure emerald pool at 5,200 feet where we made our camp while on the mountain. At this altitude there was just enough scrub for a meager fire.

We had hoped to find traces of mountain sheep in these mountains and perhaps secure specimens by which we could determine

FIG. 10—Fording the southwest branch of the Halfway River. The northwest branch flows behind the ridge seen in the distance.

what species is found south of the Peace River, but in this we were disappointed. We were well repaid, however, by the outlook obtained over the valleys of the Peace and Finlay Rivers, and the range of mountains to the northward toward which we were journeying.

[8] All altitudes were determined by aneroid, using as data Dawson's records of 2,000 feet for the Peace River at Mt. Selwyn and 1,522 feet at Hudson's Hope. Continuous travel made it impossible to take simultaneous readings at a datum point, but corrections for barometric variation were made as accurately as possible by comparison of night and morning readings. No hypsometer readings were taken, but the two aneroids used were in good agreement. One of them was calibrated by the U. S. Bureau of Standards on our return and the observations corrected accordingly.

In the dim distance, bearing N. 19° W.[9] we could distinguish a great peak, which dominates everything in this direction. This peak appeared to lie in the vicinity of Laurier Pass, our objective point, so I took its bearing with considerable care and sketched its profile in the hope of identifying it later. Because of its three-toothed outline, we called it Trident Peak for purposes of identification; and this striking contour enabled us to locate it later.

Returning to the canoe we were carried, almost without effort, by the strong, swift current, through a mighty gorge flanked by mountain peaks which swept by like an ever-changing panorama; rising on the south shore precipitously, on the north shore with softer and more rounded outlines—a wonderfully impressive scene that beggars description.

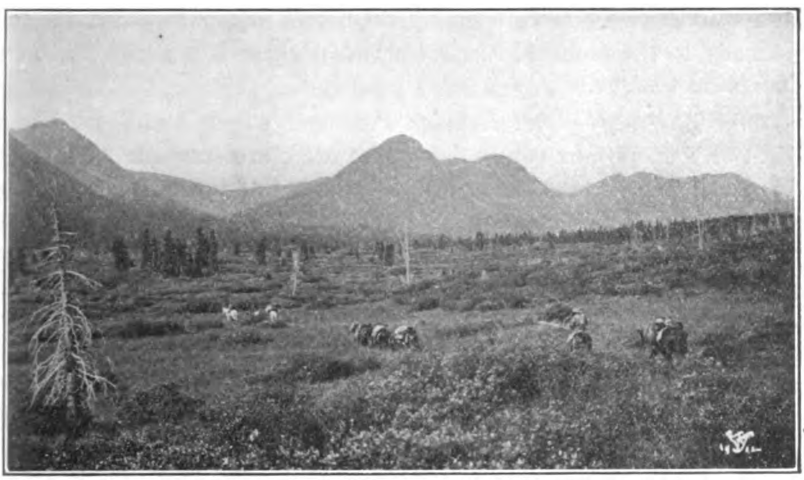

Fig. 11—The approach to Laurier Pass through the valley of Cypress Creek—about 4,500 feet. Timber-line is visible on the mountains about 500 feet higher.

The first day's run carried us beyond the mountains and through the Parle Pas Rapids—the second serious obstruction to the Peace River, which is formed by a ledge over which the river plunges, extending almost across the river bed (Fig. 9). On the north shore this ledge is broken, thus affording a channel through which a canoe may be taken with care.

Below the rapids the river traverses an area of foot hills, which

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9 All bearings are referred to the true meridian as determined in the valley of the Halfway River by an observation of Polaris, duly corrected for azimuth. The compass variation thus found, 30° E., has been used to reduce the compass bearings. The compass, with folding sights, was read to the nearest degree on a 2½ inch circle.

are steep and practically devoid of timber on the north side. For the most part they are covered with a short herbaceous growth in which a species of *Artemisia* is conspicuous, although there are some bold headlands of sedimentary rock with almost horizontal strata. Frequent exposures of coal or lignite are seen.

The south shore, however, is conspicuously different. The hills are rounded and spruce-grown, and are often separated from the river by a mile or two of bottom land.

The second day brought us to the Mountain-of-Rocks Canyon—a narrow gorge cut by the river around the flank of a rock knob that obstructed its course. This canyon forms a horse-shoe about twenty-five miles long in which the river drops 275 feet, being entirely impassable. A portage fourteen miles long connects the horns of the horse-shoe, with the old Hudson's Bay post of Hudson's Hope at its lower end. Here we obtained horses and pack outfit for the journey to the mountains. With two packers our party was now increased to four.[10]

The Halfway River, Laurier Pass and the Mountains. From Hudson's Hope our course lay northward, crossing the 1,640 foot wooded terrace which flanks the river and climbing 600 feet higher, to an open plateau sloping gradually upward to the north. For twenty-five miles our route led over this rolling slope, sparsely grown with aspens and lodgepole pines, with copses of willow and alder and some patches of spruce, until a height of land was reached at 2,800 feet altitude. Beyond this divide the country slopes to the valley of the Halfway River, whose southwest branch was crossed a few miles above its confluence with the northwest branch (Fig. 10).

We were surprised to note that this southwest branch, which appears through a gap in the mountains to the westward, carried by far the larger part of the water. On the published maps this appears as a minor tributary, the northwest branch apparently being the more important. The significance of this observation will appear later.

Our course now followed the northwest branch of the Halfway to the mouth of Cypress Creek, which led us westward to its source in the mountains (Fig. 11). The northwest branch continues, apparently, parallel to the range.

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[10] At this juncture the courteous aid of the Revillon Frères Trading Company saved us serious delay, for the Beaver Indians of Hudson's Hope were all away on the hunting trail and the trading posts were closed for the summer.

On the Halfway River we struck and followed for some miles a trail which was located by Inspector Moodie of the Northwest Mounted Police in 1897, in the effort to discover an overland route to the Klondike by way of the Pelly River[11]. Inspector Moodie, true to the traditions of the service, succeeded in reaching his goal after more than a year of hard and adventurous work, but the route was never a popular one. We found a few fragments of broken sledges and discarded cook-stoves as mute evidence of the failure of those treasure seekers who attempted to follow his lead, all of whom were forced to retreat or met a worse fate in the mountains. We found no indication of the trail having been used recently.

Following Cypress Creek, we passed through a notch between the hills into a rounded valley grown with willows and scrub birches (*Betula subulata*) and flanked by spruces and lodgepole pines. Thus we were led toward a conspicuous snow-flanked peak bearing S. 69° W. which marks the eastern summit of Laurier Pass. Like the eastern approach to Yellowhead Pass, the slope of this valley is so gradual that we would hardly have realized the altitude we were making without our aneroids. At the summit of the pass (5,300 feet) we made camp No. 34 in the last of the spruce scrub, which in all this region ceases quite abruptly at about 5,500 feet. Below this the first well-formed trees are found at about 5,000 feet, and from that point down to 4,000 feet they are stunted by the rigor of the climate, old trees with a diameter of 12 to 18 inches rarely exceeding 30 to 40 feet in height.

On the south side of Laurier Pass the snow peak above mentioned rises abruptly to about 7,000 feet. This is the highest peak visible on the eastern side of the range, and from it we obtained a fine view of the mountains to the north and westward. Because of its commanding location and convenient proximity to a roughly established base line in the valley, it was chosen as a principal observation point and called for identification, Laurier Peak.

The mountains are divided into two ranges by a valley perhaps twenty-five miles wide, containing two principal forks and several tributaries of a stream flowing to the south. The eastern range is composed largely of limestone and shale, in which springs are abundant even near the summits, being thus in marked contrast with the dry quartz rock of Mt. Selwyn. The mountains are, for the most part, rounded and not so high as those to the west. The

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[11] J. D. Moodie: Edmonton to the Yukon. *Report of the North-West Mounted Police, 1898*, Part II, pp. 3-82.

western range is a rugged chain of serrated peaks, extending approximately N. 17° W. as far as the eye can reach. Among them, though partly hidden at this point by nearer mountains, is a sharp cone which was afterward identified as the Trident Peak, seen from Mt. Selwyn. Farther north are several conspicuous snow peaks. One of them bearing N. 24° W. is especially prominent because of its sharp outline and precipitous front, which, notwithstanding the fact that it towers above neighboring snow peaks, was entirely bare of snow in August, except for a round spot near the summit. This spot, like a single glistening eye, suggests the name Cyclops for this mountain. Its distance from Laurier Peak, as determined by cross bearings, is approximately 50 miles.

Still farther north and bearing N. 20° W. is another mighty peak, completely shrouded in perpetual snow. Beyond this the mountains stretch as far as the eye can reach, the last one visible bearing N. 17° W. This bearing represents approximately the trend of the rugged sierra which constitutes the main crest of the range.

Northeast of Trident Peak and east of the main sierra is another mountain bearing N. 53° W. from Laurier Peak, which, although not so high as the main range, is conspicuous because of a fair sized glacier on its eastern front. We approached later close to the base of this mountain, which marks the northern limit of our journey.

The descent from the first summit of Laurier Pass to the median valley is rapid. We dropped 1,000 feet in three and one-half miles, and 250 feet more brought us to the bottom of the valley, 9 miles above the main fork of the stream. We crossed the valley and made camp No. 35 on the western branch of the stream, which rises in an emerald green lake near the base of a sharp cone, which, because of its comparative isolation, is a conspicuous land mark.

From this camp we made a reconnaissance of a huge crescent-shaped basin guarded by rugged limestone peaks, estimated as 7,500 feet high, which culminate on the west in Trident Peak, whose altitude is not far from 8,000 feet (Fig. 12). Then we worked northward up the northwest branch of the stream to its source near the base of the glacier peak, later crossing a 6,500-foot saddle to the northeast branch (Fig. 13).

From one of the intervening mountains we obtained a view of Trident Peak, which exhibited the precise profile (though reversed and bearing S. 5° E.) that I had sketched from Mt. Selwyn, thus completing the identification.

We hoped to be able to press farther northward through the

median valley, but a succession of snow storms, beginning August 24th, seriously hampered us in our work among the peaks so that the available time was practically all expended in making the necessary biological collections. We were, therefore, compelled reluctantly to turn back.

We were informed later by a band of Indians that this valley could not be followed much farther. They said it was possible to travel in the winter with dogs, but it was a "bad place for horses."

We decided to return by a different route, following the stream

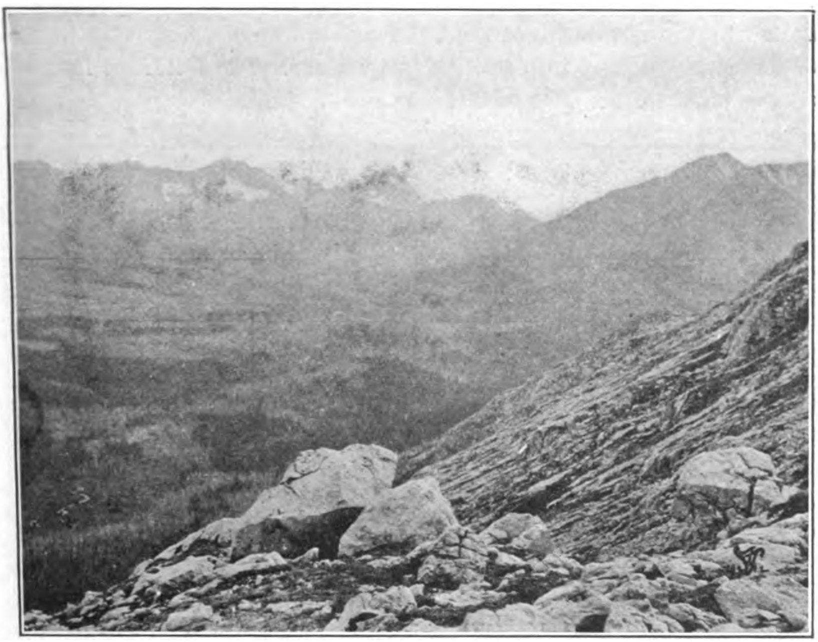

Fig. 12—Trident Peak (the sharp peak in the center) from a limestone mountain 6,300 feet high south of camp No. 35—looking S. 43° W. The two lateral shoulders are not visible from this angle.

in the median valley, if possible, to the Peace River. This stream appears on the map as the source of the Ottertail River, which enters the Peace River below the Parle Pas Rapids.

For twenty miles we proceeded without serious difficulty, traveling alternate days and using the intervening days to cut trail, but soon we became entangled in a mass of down timber which stretched in all directions as far as the eye could reach, so that five miles was a good day's travel. To add to our discomforture, the river swung

away from its southerly course and turned eastward, away from the mountains.

At this juncture, we had the good fortune to fall in with a band of Beaver Indians, returning from a hunt on the Nelson River. They frowned unpleasantly at the sight of our sheep and caribou heads, which they said were their sheep and their caribou. They were mollified, however, by gifts of tea and tobacco, and became quite communicative. They were amused by the white man's notion that the Peace River could be reached that way. To the south, they said, there was only a tangle of mountains and the stream we were following did not flow into the Ottertail, but made a big bend to the southeast, emptying into the Halfway River. The Ottertail had its source on the other side of Trident Peak.

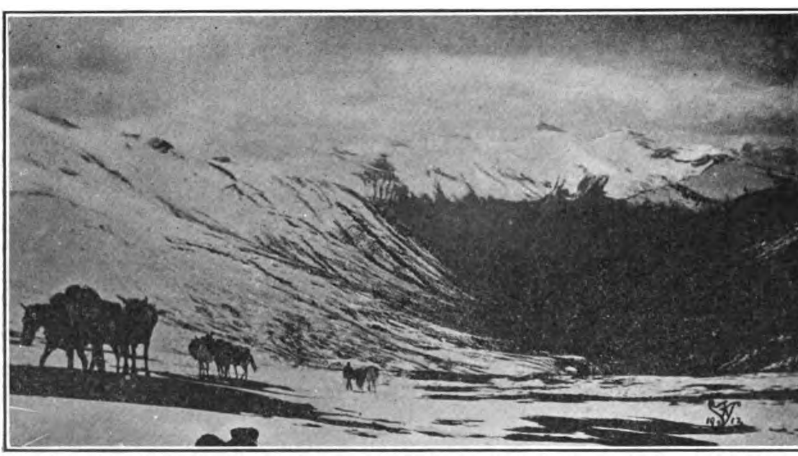

FIG. 13—Crossing the divide (6,500 feet) between camps 36 and 37, looking west toward the main range. The highest peaks of the western sierra are hidden by nearer mountains.

Thus was explained the puzzle of where the southwest fork of the Halfway River gets its water. Viewed from below no adequate water-shed is disclosed beyond the notch, almost blocked by mountains, from which the stream issues; but by flowing around this barrier range, as the Indians said, and draining the interior basin, it obtains a water-shed quite sufficient to explain its large size.

The Indians had just cut a new trail into the valley where we met them, and we were thus enabled to cross the eastern range by a 4,800 foot pass and descend into the valley of Stone Creek (as the Indians called it in their own language) which led us easily to the Halfway River, and thus to Hudson's Hope.

Stone Creek heads in a valley not far from Laurier Peak, and apparently affords an easier route to the pass than the one we had followed along Cypress Creek. An old Indian trail follows this valley.

Peace River Valley below the Mountains. At Hudson's Hope horses and packers were left behind and we proceeded down the Peace River by canoe. Below this point the river is broad and placid, flowing with a fairly uniform current of five miles per hour, without obstruction and without serious rapids. It cuts its way through the plateau without much meandering, flowing between banks from 500 to 800 feet high, which completely conceal the surrounding country (Fig. 14).

In some places there are strips of bottom land a mile or so wide.

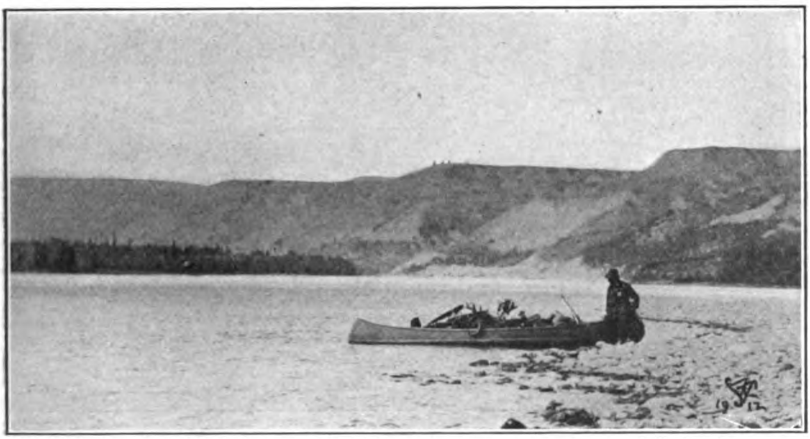

Fig. 14—A typical view of the Peace River, between Hudson's Hope and Fort St. John, showing the steep cut banks. The plateau level is about 800 feet above the river.

Two of these are occupied by the Hudson's Bay and Revillon stores at Fort St. John (Fig. 15) and Dunvegan, respectively. Both places are receiving the attention of boomers. One of the dealers in Edmonton had in his window a large relief map in many colors, illustrating Dunvegan as a fully equipped town, with several railroads, two or three bridges, electric light plants, etc. (Fig. 16); consequently, we expected to find here a thriving community. Imagine our surprise at seeing only the traditional flag pole surrounded by a few log houses of the Hudson's Bay and Revillon Companies, with a little group of Indian teepees (Fig. 17). We were informed, however, that some settlers had taken up land on

the plateau above. They had just suffered the loss of their hay through a terrific forest fire, through which we had been passing and continued to pass for three days.

These fires are the curse of the country. This one appeared to start in three different places simultaneously and is supposed to have been set by the Indians for the purpose of driving the game. At least a hundred miles of the plateau was swept clean, and the smoke of the conflagration followed us all the way to Lesser Slave Lake.

Dunvegan is typical of the numerous towns on paper that are springing up all over the country. The surveying of a townsite in the wilderness, under the peculiar land laws, is the signal for specu-

Fig. 15—Fort St. John on the Peace River, looking north, showing a break in the river bank.

lators to reap a profit from a confiding public. Some of these townsites will doubtlessly pay good returns, but in this region, as in other boom districts, such ventures are naturally highly speculative.

At Peace River Crossing we abandoned our canoe and proceeded overland to Lesser Slave Lake, where we took the Hudson's Bay Company's boat on its last trip out.

The plateau which we traversed is 1,000 feet above the Peace River. It is grown mainly with aspens and much of it has been burned. It appears to be fertile, although at this time of the year (late September) it was very dry and the only water available for camp use was found in a few stagnant, muddy pools, except where we crossed the streams flowing into Lesser Slave Lake. These

streams, however, were flowing freely, and near one of them we found a settler with a fine crop of oats.

Lesser Slave Lake occupies the center of a great alluvial bottom, which supports a most luxuriant growth of wild hay ("blue joint") standing sometimes almost as high as one's head (Fig. 18). We were informed that in the Grande Prairie region, west of the lake,

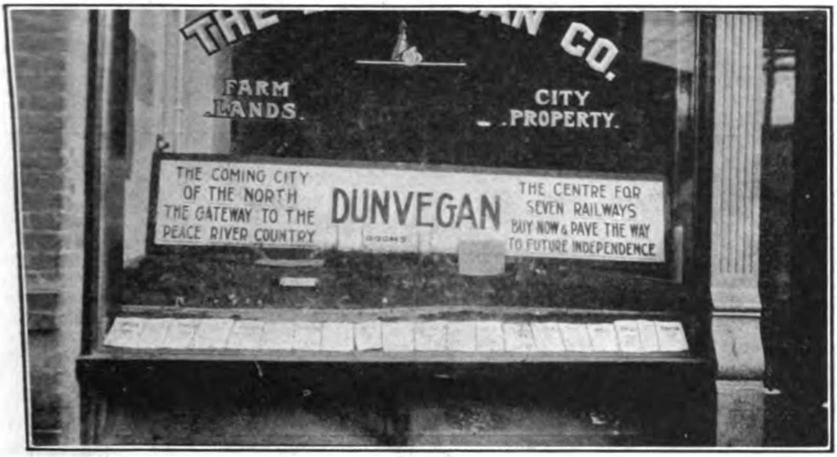

Fig. 16—Dunvegan—as seen from Edmonton.

Fig. 17—Dunvegan—as seen from the Peace River.

numerous settlers were carrying on very successful agricultural work.

Economic Development. In the valley of the upper Fraser River, the development at present (1912) consists mainly in the building of the railroad. The steel is laid as far as Tête Jaune Cache, and the work of constructing the roadbed is in progress for a hundred miles or so farther.

Some settlement is taking place farther down the river, from Fort George up through the interior plateau, but not extending to the point where the mountains begin, just below the canyon. This

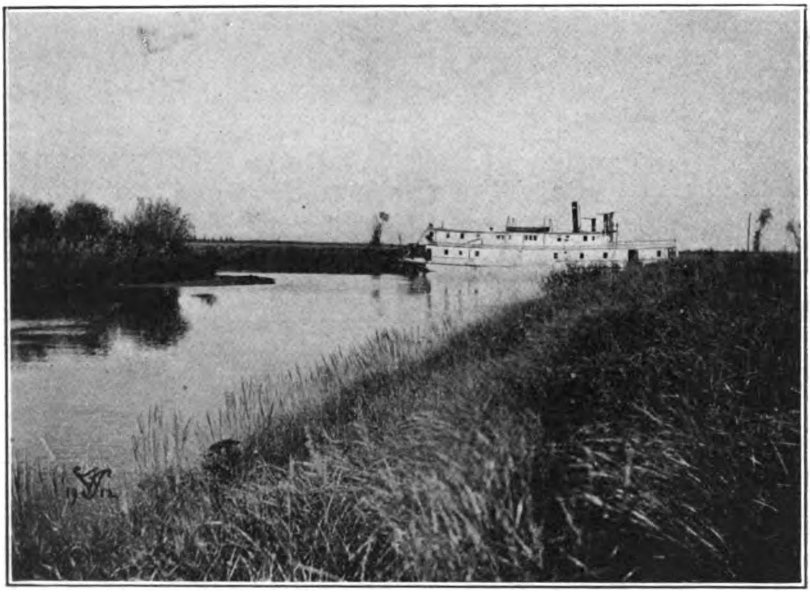

Fig. 18—The Slave River, below Lesser Slave Lake, meanders through a great alluvial basin which supports a luxuriant growth of wild hay. The many turns make navigation difficult.

settlement is being done mainly by squatters, who build a cabin and clear a little land, in anticipation of increasing values when the railroad is finished. This land appears to possess agricultural possibilities, though the mosquito pest is a severe handicap.

In the valley of the Crooked, Pack and Parsnip Rivers and in the Peace River valley as far as the canyon above Hudson's Hope, absolutely no sign of development was found, and no habitations were passed, except at the Hudson's Bay Post at Fort McLeod, where there is a little group of Sikanni Indian shacks. Much of

the upper part of this valley, near the river, is low and marshy and other parts are gravelly with shallow soil, though there are sections which may offer opportunities for settlement. At present, however, the region is too inaccessible to attract even the promoters, who are so active in the lower Peace River district.

The latter district is booming famously. In Edmonton everyone is talking of the immense possibilities of the great "north country," and people in considerable numbers are going into the country via Lesser Slave Lake. The railroad was completed this year as far as Athabaska Landing (Fig. 19), and it is projected ultimately to the Peace River and to Lake Athabaska.

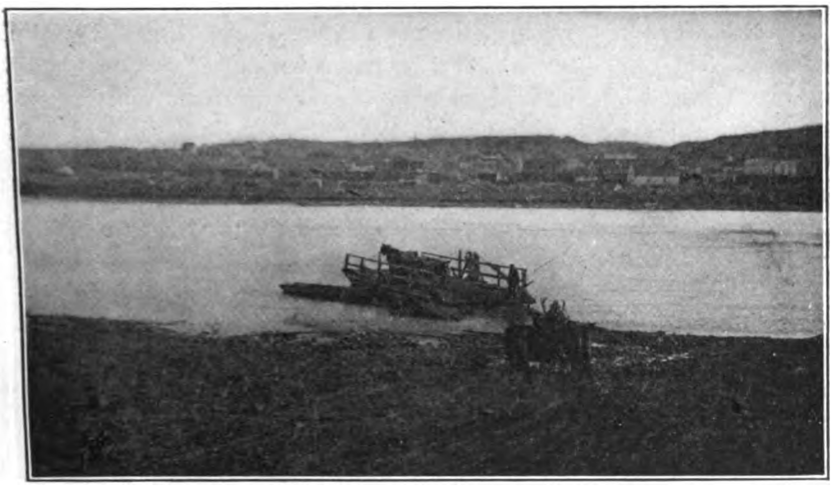

Fig. 19—Athabaska Landing, the northern terminus of a new railroad from Edmonton, and the gateway to the lower Peace River country.

The town of Grouard, at the head of Lesser Slave Lake, is developing rapidly in anticipation. Among the newest improvements are a frame hotel and a motion picture show, and other buildings are springing up like mushrooms. This is the natural gateway to the lower Peace River country, for which such great hopes are entertained.

At present, the real estate speculators are the most active of the boomers, but there is not a little bona-fide settlement going on. Mixed farming has been tried with considerable success on the plateau west of Lesser Slave Lake, especially in the Grande Prairie region, and some wheat is being raised. The optimists maintain that the lower Peace River valley will make a good wheat country,

but this remains to be demonstrated. Wheat appears to do well, provided it is not ruined by early frosts. The more conservative promoters think the future of the country lies in the direction of stock raising. The plateau region supports a fine growth of wild hay, which is said to be of excellent quality. On the eastern slope of the mountains, chinook winds moderate the climate, so that the Indians are able to winter their horses in the valleys without feeding, but in the plateau region winter feeding will undoubtedly be necessary.

Up to the present, the settlement in the Peace River valley is mainly below Peace River Crossing, though a very few settlers have begun to take up land up the river. Navigation is possible as far as Hudson's Hope, above which the river is effectually blocked by the canyon. The river bottom is fertile, and a variety of garden truck has been raised by the Hudson's Bay men at Dunvegan and Fort St. John, but the available land in the bottom is limited. It is on the plateau 500 to 800 feet above that any future settlers must rely. The steep character of the banks made it impracticable to investigate this plateau personally, so I cannot venture an opinion as to its possibilities.

In the Peace River valley colors of gold are to be found on the gravel bars, but seldom in paying quantities. The source of this supply has not been located, and the mountains are almost entirely unexplored. Mt. Selwyn is composed largely of quartz, which is auriferous, and on the Ominika River, a tributary of the Finlay, placer gold has been found in paying quantities.

Lignite and soft coal are quite widely distributed in the Peace River valley, and it is reported that a high grade of coal approaching anthracite has been found, though I was unable to confirm this very definitely.

If the present boom conditions continue, these and other resources of the country will doubtless be developed in the near future.

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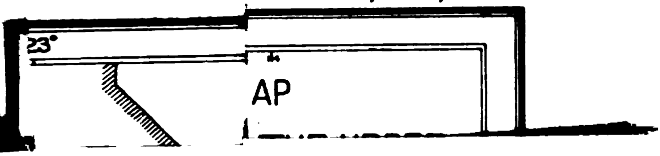


EARLY INTERPRETATIONS OF THE PHYSIOGRAPHY OF NEW YORK

By ALBERT PERRY BRIGHAM

In reading for another purpose, several references to the land forms of New York have been found, which belong to the early years of the nineteenth century. They represent the partial knowledge of that time and often err in description as well in interpretation, but at a number of points they are also prophetic of modern views. It is not in our present purpose to trace the history of thought concerning any of these physiographic features back to ultimate sources, nor to follow the evolution of doctrines to their present stage, but to recall a few descriptions and explanations, which men, with their eyes open, have left on the records of that time. In the history of the science of physiography four score or a hundred years carries us back to ancient times.

In 1795, the brilliant grandson of Jonathan Edwards, Timothy Dwight, who had learned the alphabet at a lesson and read his Bible at the age of four, was elected president of Yale College. Like some other college presidents, he found much to do and found also that he could not endure too much confined and studious life, and he took to travel, kept a journal, and this fruit of his vacations may be found in four volumes, which in their keen and vigorous descriptions of things as he saw them are probably more fresh to-day than the volumes of theology for which he was famous.

One of his journeyings included Niagara. Prior to his comments on the great waterfall he makes an observation whose truth has still to be taught to boys, namely, that the River St. Lawrence is one, from its sources near the Mississippi to its union with the ocean, continuing through the lakes as truly as the Rhone is the Rhone, above or below the Lake of Geneva, and as surely as the Rhine maintains its identity at either end of Lake Constance. He quotes the opinion, even then commonly spoken, that the falls began at the brow of the Queenston precipice. Many had said it in order to give the earth more age than Moses was supposed to have given it. Dr. Dwight is not disturbed, but concedes the recession and quotes Cohoes, Canajoharie and Passaic as other examples. But in these cases recessions have been less, and he proceeds to set forth the reasons in language that would pass in a modern text book. Some stones are of "firmer texture" and therefore less liable to wear: or

are less exposed to "decomposition by the weather," and in some cases the stream is "smaller and less rapid." Certain falls on the Connecticut show rocks so hard and compact that there has been little recession. On the other hand, he thinks Glens Falls have gone back five miles, from Fort Edward. He had himself noted the changes there for fourteeen years, from 1798 to 1812, and had made sketches as a basis of comparison. He urges that Niagara is a powerful river, a hundred times as big as the Hudson or Mohawk. The limestone he thought resembled that of Glens Falls. The rate would depend on seasons and places, and, therefore, "regularity is in no sense attributable to the process." He particularizes as to the mode of wearing at Niagara; the "inferior" parts waste more rapidly than the "superior" parts, there is "continual sprinkling," and he refers to the "attrition of such immense mass of water," and "alternations of heat and cold." He then speculates on the final result, the draining of Erie, perhaps suddenly, with a great deluge below.

But notwithstanding this squint toward cataclysm, Dr. Dwight comes back to his wonted serenity and observes that "on this subject there is no reason for apprehension. Before the waters of Lake Erie can be sensibly affected by the recession, it must have passed through a distance at least three, and probably four times as great as that between Queenston and Niagara." He evidently takes no account here of the dip of the controlling strata, but he is quite as comforting as Mr. Gilbert is, when he considerately defers the final drying of Niagara for about 3,000 years, for Dwight gives us 16,000 years, in case all goes on about as in time past. The river also is wider by three times, and the rock is thicker at the head of the rapids, both serving as retarding conditions, as the recession proceeds. Again he reminds us of one of Mr. Gilbert's papers, in which the uncertain elements of the Niagara problem are thrown into a long list of questions, for Dr. Dwight, with equal caution, says,—"It is to be acknowledged, however, that many uncertainties accompany this inquiry, and that the result of it must be dubious for a variety of reasons."

Some years before Dwight saw Niagara, or in 1787, the falls were visited by Captain Enys. He quotes two arguments as commonly used to show that the cataract was once at "the landing," that is, Lewiston. The first was the abrupt rise of the river banks at that point; but Enys thought more of the second reason, that within man's memory the position of the falls had changed. He comments

on the long time required, but he is specially doubtful about the removal of so much rock by the river. It seemed to him as if the mass of rocks falling at the base of the cataract must have turned the fall into a rapid.

In 1795-1797 Isaac Weld traveled in the United States and commented on changes that had taken place since the discovery of the falls. He interprets recession as due to removal of the under beds and the fall of the upper strata and accepted the idea of the original position at Lewiston.

At about the same time C. F. Volney recognized that the river had hollowed the chasm and carried the breach, from age to age, back to its present position. "There it continues its secular labors with slow but indefatigable activity." He suggests that a precise description of the present state of the cataract ought to be drawn up and that it would become from age to age a valuable document for comparison. This was done by James Hall almost fifty years later.

Mr. John Maude visited the falls in 1800 and published his account in London in 1826. He accepts the prevailing view of recession and adds the interesting information that the falls do not come from a mountainous country as so often asserted but "from one flat country of vast extent to another flat country more lowly situated." As if forecasting the coming century's unending studies and theories of Niagara, he adds—"What a field for speculation!"

Francis Hall, traveling in America in 1816–1817, adds the pertinent observation that the name, *horse shoe,* hitherto given to the larger falls, was no longer applicable, for the shape had become that of an acute angle. He also suggests the possibility of computing the time occupied in the recession from Lewiston. G. Fairholme, in the *Philosophical Magazine and Journal of Science,* computes the probable age of the falls as 4,000 years, but he appears to have been helped in his mathematical operations by the fact that this figure carried the history of the river back to its beginning, the Mosaic Deluge! In that generation, as in this, Niagara was provocative of more study and more discussions than any other single physical feature of the continent.

One of the keenest observations in the early literature of the Great Lakes and Niagara is by G. W. Featherstonhaugh in 1831. "In ancient times when the whole country was under water, and Ontario and Erie were on a level, the cataract of Niagara did not exist; but when the general subsidence of waters took place, when

Erie fell below the level of the Illinois, and Ontario below the level of the Queenston ridge, the waters of Lake Erie would of course take a direction to join the great eastern line of drainage."

About the same time Mr. Grant of the Congressional Committee on Roads and Canals made a reference to the changes of Niagara. Whatever his sources of information, he had not gone beyond the "bursting-of-the-barriers" theory as regards the upper lakes, but he fully recognizes the recession and refers to the fall of Table Rock in 1818 and 1828, the date of his writing being 1838. But he then turns to an interesting speculation about the future. In the recessions to be witnessed by future ages, the crest will "assume a lower plane, until it eventually sinks to, and becomes an element of, a general slope, over which the great volume of the upper lake shall flow." He could hardly use better language for describing the condition of grade to which part of the great drainage floor would be brought. The waters of Lake Erie would recede and there would be a "succession of *berms* converging toward the outlet of Niagara." He thus uses for beaches in general an old word which seems now to be rare and used only in more technical senses. Such berms, says our Congressman, show that similar recessions of Ontario have occurred. He even extends his reasoning to the entire Laurentian system of waters. The St. Lawrence itself may have passed through a waterfall stage similar to that of Niagara, and similar changes may take place between Erie and Huron, as between Huron and Superior. "In a word," he says, these upper barriers "may be worn away by the irresistible waters, and Superior find its way over one continuous and inclined plane, to the broad bosom of the Atlantic."

Dr. Dwight had not been behind, many years before, in foretelling what must happen at the foot of Lake Superior. Referring to evidence that Lake Superior had subsided six feet from some former level, he turns from the specific observations to general principles and urges that the St. Marie is no doubt continually lowering its bed, and that the subsidence of level "can excite no surprise."

It will be natural here to turn to Little Falls and the recession of Lake Ontario. In 1802, the Rev. John Taylor made a missionary tour in the Mohawk and Black River country. On July 27 he visits Little Falls, "a small village of the town of Herkimer." He sees the canal, three-fourths of a mile long, with six locks constructed seven years before. He looks about and thinks it "demonstrably

evident that the waters of the Mohawk, in passing over that fall, were 80 or 90 feet higher in some early period than they are now. The rocks even an hundred feet perpendicular above the present high-water mark are worn in the same manner as those over which the river passes. The rocks are not only worn by the descent of the water, but, in the flat rocks, are many round holes worn by the whirling of stones." He saw holes that were five feet deep and twenty inches across and was sure water had done the work, and he infers, therefore, "that the flats above, and all the low lands for a considerable extent of country, were covered with water and that here there was a lake—but the water, having lowered its bed, laid the lands above dry."

A few days later he stood on the high ground of Steuben, in Oneida County, north of the Mohawk Valley. He looked down on Oneida Lake, across to Clinton and beyond to what he thought were the Catskill Mountains. He was told that from the tops of the trees one could see Lake Ontario, but he seems to have denied himself the pleasure of climbing them. But looking about, he found sea shells in the stones, and he says the land is so high that the shells cannot be accounted for by supposing that the rocks at Little Falls were once united, for this land is evidently much higher than the mountain at that place. He was willing to push his lake westward, but we need not wonder that these stony sea shells did not appear to buttress his theory.

Dr. Dwight's later account of Little Falls is short, but marked by his usual temperance of statement. He makes no doubt that the mountains there were anciently united and that there was a lake above, but he thinks this water was "gradually emptied by the wearing away of the earth and stones which originally filled the gap." Years later, however, a writer who finds place in the volume on the great celebration at the finishing of the Erie Canal, refers to "some mighty convulsion of nature" in which the waters on the west tore a passage through the barriers of mountain granite. This observer's estimate of the width of the gorge may have suffered from the excitement attendant on the festivities of that unique voyage, for he says that at one point "the craggy promontories approximate nearly to the toss of a biscuit."

Much better than this is the reference of Timothy Bigelow, who stopped here in 1805, on his way to Niagara, twenty years before the two historic barrels of Lake Erie water voyaged down the Mohawk Valley along with DeWitt Clinton. Mr. Bigelow notes the

water action on the rocks and the potholes and then says: "It is certain that heretofore the falls must have been much greater than they now are, and that the German flats, and other low grounds near the river above, must have been the bed of a lake." I do not know that Mr. Bigelow was, like Dr. Dwight, a theologian, but he finds at Little Falls evidence of the infidelity of some of the people, who knew Adam was not the first man, or else the Scriptures were wrong in giving him a date, because it must have taken more than 5,000 years for the Mohawk to have broken through the rocks, at this village. One of the most observant persons who saw much of the state of New York in the early part of the last century was William Darby of New York City. Mr. Darby seems to have been a good deal of a traveler, and on the occasion to which we now refer he made a trip to Detroit and the Michigan territory, going by way of the Hudson, Utica, the Thousand Islands, Great Sodus Bay and Niagara, and returning by the south shore of Lake Erie, and by the Cherry Valley route in New York.

He observes of Little Falls that the cataract is due to a chain of granite mountains, of moderate height, crossing the Mohawk here. He considers them as a continuous branch of the Catskills, which he calls the Catsbergs. We would hardly expect this traveler, in 1818, considering the wooded and unsettled condition of the region, to know that the crystalline rocks rise but 150 feet above the stream, and even less where most obvious, or to see that they were surmounted by ordinary sedimentary rocks. He speaks of this as "a region where rivers appear in many instances in their youth." No doubt he did not put into these words a modern physiographer's meaning, but one would like to know exactly what he did mean. He quotes approvingly, and at some length, the views of DeWitt Clinton about the place, a description of which had been quoted by Dr. Mitchell in his notes on Cuvier. Clinton has a great lake to the westward, absorbing Oneida Lake, and by the recession of the waters, some thousands of acres of rich land were uncovered. Rome is recognized as the summit, and the waters drew away from it on each side, leaving on the west the marshes along Wood Creek. "Made ground" was in evidence thereabouts, and logs were encountered at depths of twelve feet. No one would dispute Clinton's closing dictum, as follows: "This great lake, breaking down in the first place the barriers which opposed the progress of its waters to the east, and gradually receding to the west, is a subject well deserving of minute investigation." That the great canal digger could

not know the wide meanings of Iroquois and pro-Iroquois waters, and that he had never heard of glacial dams, nor dreamed of Gilbert or Spencer or Taylor, does not discount his acute appreciation of the importance of the problem.

References to the Ridge Road as a shore of a larger Lake Ontario are abundant and specific. Mr. C. Schultz in 1807 recognizes the ancient Ontario plain and describes the Ridge Road as on a "long, narrow, indented strip of land . . . . . composed entirely of coarse gravel, pebbles, shells and other marine productions," and concludes that it had evidently been the shore, beach, or sand bar of the ancient lake.

Mr. Darby makes several references to the recession of Lake Ontario. He thinks, along with others, that a barrier had been broken through at Quebec, draining a large lake and drawing down the waters, exposing lands about the upper St. Lawrence and Lake Champlain. After the Quebec blockade was cut away, he thinks a similar barrier yielded at the Thousand Islands and that for a long time there was a cataract near where Brockville now is. When this granite mass was cut through, Lake Ontario was much diminished in depth and extent, and then he thinks the cataract of Niagara may have commenced. "If," says our traveler, "a similar effect had been produced in the St. Lawrence that has taken place in the Hudson, then would the Atlantic tides have flowed to Niagara." But what it was that made the submerged channel of the Hudson he does not try to say. He does observe, however, that if the Thousand Islands barrier were entirely removed, much more dry land would appear, but a lake about 250 feet deep would still remain. It would be deeper in fact, but he is assuming 492 feet as the "medium depth of the existing lake."

He also finds evidence of a lowering of surface at Sodus. Around Sodus is a broken surface, but the "fissures" have been worn since the recession of the lake, or as we should say, the ground has been channeled by postglacial erosion. Once on the plain, however, it runs smooth over a wide extent of territory. Plainly, he thinks, the lake has receded at different times. I quote the following sentence. "The natural turnpike (Ridge Road?) is upon the alluvial plain: upon this ancient shore of the lake its waves must have beat many centuries, and yet incontestible evidence exists to prove that, for perhaps so many or more centuries, this lake must have had a surface twenty or thirty feet above the natural turnpike." Not knowing the detailed topography of the Sodus neighborhood, I am unable

to interpret the precise meaning, but whatever he means, he is not sparing of time for these superficial and geologically recent changes. He touches vividly the sluggish drainage of the district north of the lake when he alludes to a creek near Lyons which resembles rather a bayou in lower Louisiana than a water course in the state of New York.

In general remarks, a kind of summary in an appendix, the author takes a further step and presents his idea that "through either the Mohawk or some valley to the southwest of that village (Rome), once flowed the St. Lawrence River. Rome is only 188 feet above Lake Ontario; and the valleys of the Chittenango, perhaps not so high even, were near the sources of that river." The last passage reveals the writer's ignorance of the divide between the Ontario and the Susquehanna waters, as does a later statement in which he says that if Ontario waters were ever 188 feet above the present level, they discharged "either by the Mohawk or Susquehanna or both." He adds that "the chain of small lakes west of Rome (that is, the Finger Lakes) north of the dividing ridge, and east of Genesee River, were once bays of Ontario." Thus we are carried forward to the outlines of the south shores of Warren and Iroquois.

It must be confessed that Mr. Darby's account of Niagara comes closer to rhapsody than to scientific writing, and he makes no scruple of saying that "no man ever did or ever can trace this ground, without the intoxication of enthusiasm." He would have been staggered, perhaps, by the hardened self-possession of some modern observers. When, however, he reached the escarpment he says,—"It is when standing upon the brow of these heights, that the fact becomes demonstrative that here once dashed Niagara, mingling his foaming surge with the wave of Ontario." In the light of the Iroquois beach curving around at Lewiston, this has a modern sound, as does also what soon follows. The fall "continues its slow but certain march to Erie. Time was when Niagara did not exist and time will come when it will cease to be."

In one passage the Mohawk is said to occupy the "narrow vale of two exhausted lakes." One of these was, of course, to the west, and the other, as he thought, reached up to Little Falls from the Highlands of the Hudson. For he held the usual theory of older days that the Middle Hudson, even up to Hadley's Falls, was the bed of a lake which finally burst the Highland barrier. Darby observes that streams from both sides enter the Hudson by falls, and

he notes that streams on the west have a northwest direction, and on the east they flow to the southwest. He makes no reference to the control of the mountain axes, and was three-fourths of a century too early for the term longitudinal. He argues that the lower Hudson is a bay rather than a river, and then follows perhaps the most interesting physiographic reference in the volume. "By what process of nature did the Hudson scoop its present channel, so far beneath the bottom of the former inland sea, so far even beneath the level of the ocean, and through a continuous mass of rock? If you can answer this query you will do me and the world a favor. I am unable to even conjecture the process of this mighty, this unequalled work."

Going north from Utica, Darby observed the Utica shale, calling it "secondary mica slate," and the big crystalline boulders, which he calls pebbles. He owns that he cannot explain them, but is sure that neither fluid nor frozen water could have done the work. Notwithstanding his disclaimer, he cannot resist trying his hand with the usual Canadian Sea, flowing south over a surface that was "uniform through inclining." But after all, twenty years later, Hall and Vanuxem and Hitchcock were struggling with the same problems, while their greater body of facts made the puzzle more perplexing. Darby observes the scanty soil on the limestone in Jefferson County, but does not try to explain it. He also refers to the Nipissing route from Lake Huron to the Ottawa River, and to an intended canal by Lake Simcoe which would shorten the distance from Michilimackinac to York, Canada, to 350 miles as compared with 650 by the Niagara route.

Among the drumlins of western New York, to which he refers as ridges parallel to each other and to the chain of lakes, he finds himself astonished as he rises and falls with the passage of the road over them. And he observes that if their intervening valleys were filled with water, a cluster of islands would be produced of astonishing resemblance to that of the Gallops in the St. Lawrence River. "The ridges have the same globular swell which you will remember, I have noted, as characteristic of the features of the Gallops." These islands are in the river below Ogdensburg and are not to be confused with the Gallops in the northeast part of Lake Ontario. The rising of the water on the drumlins, combined with the reference to the islands of the St. Lawrence, inevitably recalls Mr. Wilson's recent paper before the Geological Society of America, in which he recognizes the islands and headlines of the Sackett's

Harbor and Thousand Islands region as due to headwater dissection by the members of a great stream, and subsequent partial submergence. Darby notes the peculiar features of that region when he says it is "difficult to mark with precision the termination of Lake Ontario, or the commencement of the Cataraqui or St. Lawrence River." He cites the Schoharie River as showing how little the mountains of the United States influence the direction of its streams: but he shows that he had been affected by Hutton or some other modern influence when he says, "I have long been of opinion that the accidental agency of earthquakes and volcanoes has been overrated, whilst the slow, but constant influence of water has met with too little attention from philosophers and naturalists." This, we should remember, was twelve years before the first volume of Lyell's Principles came from the press.

Old notions of the "Alleghany Mountains" are so confused that it is difficult to understand or to quote them. One of the familiar phrases of the voluminous Erie Canal literature is Mr. Christopher Colles's dictum that the Alleghany Mountains die away as they approach the Mohawk, and the long Rochester and Utica levels of the canal are cited in proof of this. The escarpment at Lockport, surmounted by the great chain of locks, was commonly called the "Mountain Ridge" and, as I suppose, was counted a part of the Alleghanies. Dr. Dwight fully shares the ignorance of his time. He went west by way of the Catskills, Otsego and the Chenango Valley, and considers the "Katskills" by far the highest land in the state. The Alleghany range, according to him, "terminates near the headwaters of the Genesee River, and is visible from the great Western Road to Niagara." This is not clear as to his view, for it is not open to us to believe that he saw a hundred miles across the uplands of western New York. But he does pretty well in his reference to the space between the Kaatskill and its dependencies on the one hand, and his hypothetical Alleghany range on the other. It is the region of the Susquehanna headwaters, and he describes it,—"as filled up with hills and valleys, running in a great variety of directions, so great that to the eye on elevated ground the whole region appears to be a mere mass of confusion."

Mr. Darby describes what he calls a "remarkable chain of hills" separating the Ohio and St. Lawrence waters. He traces the divide in detail especially in New York and around the head of the Genesee, and describes the "ridge" as falling abruptly to the north, and sloping gently to the south. He also refers to it as "this singular spine south of Lake Erie" and observes that it divides a country

full of lakes from a region in which lakes are rare. He elsewhere speaks of this ridge as the "spine of the Alleghany," and as he recognizes a granite nucleus of this mountain system, we must suppose that he had some notion of the more primitive elevations that extend from the New York Highlands to the southward, and regarded the "spine" as a great westward branch of the system.

Mr. Elkanah Watson wrote a book on his travels in New York and his views of canals, emphasizing his personal claims as to the original projection of the Great Western Canal. Except for the line of levels through the state, he seems almost as blind to the topography as Mr. Darby is alert and of open eye. But he does appreciate, without the slightest inquiry as to its origin, the symmetry of the land between Seneca and Cayuga Lakes. The land he says rises gradually from opposite shores, and almost leads one to believe that the whole country is the work of art. Any one familiar with Finger Lake topography will appreciate this lone bit amid Mr. Watson's rush of enthusiasm about ditches, settlers and the growth of a glorious country.

We must not omit an early Onondaga writer's allusions to the volcanic theory of salt. In ancient days when yet the sea covered the earth, a vast eruption evaporated so much sea water that bodies of fossil salt resulted. But our writer warily says,—"We are inclined to no particular theory." He does not seem to care how the salt was made, and is only afraid that it may sometime give out.

Few features of New York are of deeper interest than the abandoned river courses through which the glacial waters escaped in the descent from the Warren to the Iroquois plains. Near Syracuse are the gorges or amphitheatres which hold the so-called Green Lakes of Jamesville and Fayetteville. We know these splendid limestone cliffs as produced in the recession of great cataracts of late glacial time. But they had long been an occasion of speculation among local wise men, and a history of the town of Manlius, by a local historian, refers to the theory that these basins are volcanic craters. "But," says he, "the more settled geological opinion holds to the downsinking of the areas, that is, by the subsidence of a fault block."

We have looked back fourscore or a hundred years, enough to appreciate the ignorance and the partial knowledge of those times, but to little purpose if we do not also appreciate the keen interest, the sober thought, the shrewd guesses, and the acute prophetic glimpses of facts and principles, that have a settled place in modern physiography.

NOTES ON THE DESCRIPTION OF LAND FORMS—XI

The Physical Features of Morocco.

LE MAROC PHYSIQUE. By Louis Gentil. 320 pp. F. Alcan, Paris, 1912.

The distinguished explorer of Morocco, Louis Gentil, Professor of Geology at the Sorbonne, has lately prepared a serviceable summary of the physical features of that country, to the knowledge of which he has so largely contributed. Certain chapters of his book will afford geographers excellent information regarding matters of fact, and will at the same time exhibit the manner in which the division of their science that is concerned with land forms is treated by an expert geologist. The book opens with a brief empirical description, excellent of its kind, in which the larger physiographic divisions of Morocco are concisely set forth. Then follow nearly 30 pages regarding the growth of scientific knowledge of that country, over 60 pages on its geological history, and 60 more on the rôle of the two Moroccan mountain systems in the orography of North Africa; the larger system being the Atlas, consisting of several ranges which extend southwest from Algiers to the Atlantic, and the smaller one being the Rif (or Little Atlas) which forms a curve convex to the south in the northern part of the country, with its western arm pointing to the Strait of Gibraltar, across which it is continued northeastward in the mountains of southeastern Spain. Two chapters on the relief of the surface and the evolution of the drainage lines, of which more below, are discussed in 35 and 40 pages respectively; after which climate, vegetation and soils are allotted chapters of somewhat less length.

A peculiar feature of the chapter on Relief or Surface Forms is found in its geological classification and treatment. Its chief sections are:— (1) Influence of Primary (Paleozoic) folding, under which it appears, for example, that a west-central area, bordering the Atlantic and called the Moroccan Meseta or Tableland, is largely covered with horizontal strata of Secondary or Tertiary age, but that in certain districts the removal of the covering strata reveals an underlying body of folded primary strata, for the most part reduced to a peneplain, yet here and there surmounted by ridges of the most resistant strata. (2) Influence of Tertiary folding; here are placed, for example, the several ranges of the Atlas system, in one of which certain anticlines of Mesozoic strata are well preserved while others are breached along their crest, and hence this range is regarded as "very young" (171); but in treating the complete anticlines as "preserving their original form," the author gives at least some of his readers an under-impression of the erosion that has taken place. (3) Influence of epirogenic movements and great faults; here one finds an account of successive broad elevations and depressions without significant deformation, one of the most recent and interesting examples being that by which a former passage between the Atlantic and the Mediterranean, south of the curved range of the Rif, was laid dry, and a gap in this system between the Rif and the mountains of southeastern Spain was submerged to form the Strait of Gibraltar; brief mention is also made of strong faults of relatively modern date, which limit the central mass of the High Atlas on both sides, but their influence

on the present landscape is not here (177, 181) explicitly stated; only farther on in the chapter on the evolution of drainage is the southeastern fault escarpment said to be "furrowed by deep valleys which follow the line of most rapid slope," while at the opening of the valleys on the piedmont plain the spurs between them terminate in facets, "which testify to the relative youth of the form of the range" (212). (4) Relation of relief to rocks, such as granites, which appear in the High Atlas and form part of its crest; limestones, of which the more resistant beds, where folded in the Atlas ranges, produce a Jura-like topography, emphasized by the dryness of the climate, or where lying horizontal. as in the eastern plateau bordering Algeria, determine tabular forms; while the weaker beds, as in the cover of the Meseta on the west, have softer forms; volcanic rocks, of which one large mass known as Siroua, lies on an elevated granite peneplain in the heart of the mountains, and once resembled Etna of to-day, but is now dissected like the Cantal of central France; and so on, with slates, sandstones and other kinds of strata.

It is to be noted that while the descriptions of surface forms in this chapter sometimes place the present result of erosional processes acting on structural masses in the foreground, prominence is given quite as often to the past action of erosional processes on structural masses; that is, the treatment of the surface is as largely geological as it is physiographic; and further that while technical geological terminology is freely employed wherever wanted, a correspondingly technical physiographic terminology is avoided even where it might be helpful.

The chapter on the evolution of drainage presents many details which serve to amplify and complete the physiographic pictures outlined on earlier pages; but it is a question whether, in order to avoid incompleteness there or repetition here. it would not have been better to treat the problems of relief and drainage together. For example, the earlier description of breached anticlines (171) is now in part repeated in connection with the explanation of their axial valleys, which are here as before said to be "bordered by monoclinal crests" (207); the earlier description of the dissected volcano of Siroua (200) is now partly duplicated in the explanation of its radial valleys (213); and the earlier mention of the laying dry of the ancient strait between the Atlantic and the Mediterranean (178) is now in part repeated in the discussion of its drainage (205). Further, the postponement to this chapter of the statement that "the carboniferous folds have imposed, in the paleozoic region of the Atlas, a general direction on the principal valleys which descend from the crests to the great plain of Haouz" (206), leaves the previous statement regarding the relief of this district (167) essentially incomplete. Physiographic terminology is here again little advanced from its elementary incompleteness in the previous chapter. True, the drainage of the folded limestones in the High Atlas is said to have a very close adjustment to the structure (208), but in the absence of a concisely phrased account of the hard and soft beds involved in the folding, the reader is left with an abstract generality in place of a specific landscape. Again, "It is natural to think that phenomena of capture have been frequent in the evolution of the drainage of the High Atlas" (208), and several examples of capture are mentioned; but usually without concise indication of those significant details of visible existing form, the observation and description of which are both so much favored by the possession of a systematic terminology—

because the possession of such a terminology implies the understanding of the elements of form to which the terms apply. Likewise, the tabular limestone region of the Algerian-Moroccan border, briefly mentioned under limestone reliefs (191) but not referred to in connection with "great faults" (177), is now described as divided into a number of fault blocks, trending E.N.E.–W.S.W., with uplift on the southeast, thus forming a flight of steps with broad tread and relatively small rise (221); it is thus implied that the steps are directly due to faulting, but in the absence of a terminology which discriminates between fault-scarps (due to faulting) and fault-line scarps (due to erosion of a faulted structure) the lack of critical discrimination as to the nature of the steps is expectable. It may, of course, be urged that a volume of a "Nouvelle Collection Scientifique" ought not to be too technical, and that various physiographic terms, the absence of which is here regretted, have therefore been wisely excluded: yet in earlier chapters one finds an abundance of technical geological terms, such as beds with *Pleurotomas,* Burdigalian sediments, calcareous marls with *Harpoceras opalinum,* structures of Caledonian, Hercynian or Armorican trend, which are just as definitely helpful in the paragraphs where they occur as physiographic terms might be in the chapters on relief and drainage where they are now lacking.

To studious readers, interested not only in the geography of Morocco, but also in the development of a thoroughly disciplinary and intelligible method of regional physiographic description by intentional experimentation with many methods, and the eventual selection of one that will best serve the ends in view, Gentil's book is welcome and helpful on several grounds. The first ground is of course the truly intimate acquaintance with many facts of Moroccan structure and form that has been gained by this ardent explorer through his own field work and through comprehensive reading; for manifestly no good experiment in description can be made by one who is ignorant of the things that he wishes to describe. Another ground for gratitude is the thorough test here given to the method of describing surface relief on a geological plan, for the value of such a method can be discovered only by giving it a fair trial, and the fairest trial is secured from an author who likes the method and who publishes the application that he makes of it; but in the present writer's opinion, the result of the trial does not recommend the method for further use in regional geography, because it too frequently requires that several diverse elements of a single landscape, closely associated in their natural occurrence, should be described on far-separated pages in association with systematically similar but geographically distant elements. An additional feature of the author's method is the interesting device of treating the evolution of drainage after and to that extent apart from the description of surface relief; for here again the merit of the device can be measured best by submitting it to a serious test in friendly hands and then publishing the results; but as before, the results do not commend the device for further use in regional description.

Another matter, by no means limited to this book but brought forward by it, is the important problem concerning the best use of local place-names as guides to the location of physiographic features. Place-names abound on Gentil's pages, and as the simple outline map in the text contains very few of them, their location must be looked up elsewhere. This is usually done as a matter of necessity, even as a matter of course by the persistent reader

of geographical essays; the problem here raised involves a difficulty of another kind, namely, the use of a local, little-known place-name as a means of locating a perfectly conceivable physiographic detail. I believe that this is not consistent with the best geographical usage, which demands that—apart from widely known place-names, like Gibraltar—physiographic details should be located in relation to larger physiographic elements, and these again in relation to still larger physiographic features, the general positions of which are stated at the outset, as is done in the first pages of Gentil's book for the chief physiographic provinces of Morocco. After a physiographic detail has thus been located, the little-known place-name associated with it may be introduced; if this order is reversed, the difficulty of forming correct mental pictures of the districts described is greatly increased.

The use of little-known place-names as guides to the location of physiographic features adds to the difficulty in books which, like Gentil's, have no index. Consider, for examplpe, the statement that granitic rocks extend from the crests of the High Atlas almost to "Tazenakht" (180). This name being unknown to many readers, the extension of the granites is vague as to direction and distance: therefore a rapid search may be made for Tazenakht (few readers have time for a careful search) through the earlier pages descriptive of the High Atlas, and if it is not found there, it must be looked for on such large-scale map of Morocco as may be accessible. In my own case, the name "Tasenacht" was found on a German map; it appears to be a village lying, as might well have been said in the text, "about 60 kilometers southeast of the mountain crest on the border of the Saharan plateau" (a feature previously explained): thereupon the extension of the granitic area becomes sufficiently definite. The addition of phrases like the one here suggested would increase the size of the book, and its intelligibility as well.

Finally comes the problem of verbal description without the aid of diagrams. There are only two black and white maps of small scale, and no sections or figures in "Le Maroc Physique"; hence the insufficience of graphic aids must be regarded as its chief defect. The reader would be greatly assisted in understanding, for example, the general relation of the Saharan plateau to the southeastern slope of the Atlas by means of a section, or still better by a block diagram; no such assistance being given, the relation remains uncertain and the reader unsatisfied.

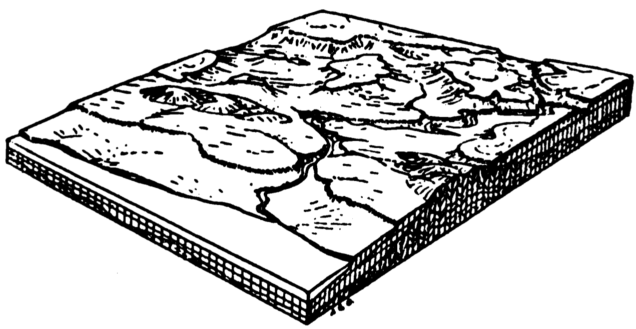
Theory and Use of Block-diagrams.

La Théorie du Bloc-Diagram. By Paul Castlenau. *Bull. Soc. de Topog. de France,* Vol. 36, 1912. 16 pp.

Apropos of the closing lines of the preceding note, attention may be called to the above-cited article on the theory and method of construction of block diagrams, from which an increase in the use of this graphic device by French geographers may be hoped for. The discussion of the theory is, however, limited mostly to the geometrical elements of formal perspctive, and the the representation of non-geometrical surface forms is unfortunately but little considered. The essay closes with excellent advice:—"The chief thing is to make a beginning, without allowing oneself to be discouraged with the first unfruitful trials."

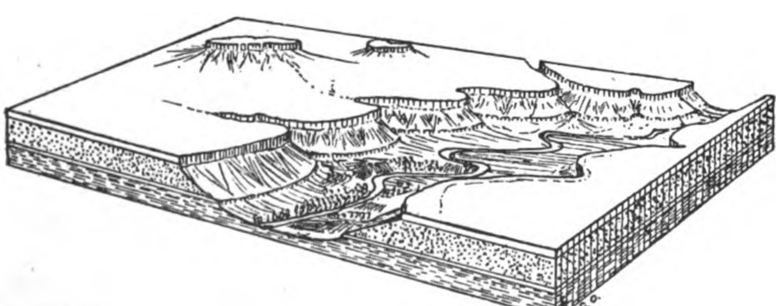
NOTES ON MOROCCAN GEOGRAPHY. By A. G. Ogilvie. *Geogr. Journ.*, Vol. 41, 1913, pp. 231-237.

Ogilvie here returns to a subject he has already treated ("Morocco and Its Future," *Geogr. Journ.*, Vol. 39, 1912, pp. 554-569), following Gentil; but while his previous article had no illustrations, the present one is embellished by a number of good photographs by the French explorer and elucidated by several diagrams. Two of these show in simplified bird's-eye views the leading features of relief before and after the formation of the Strait of Gibraltar; the drawing is rude but immediately helpful. Two others are block diagrams, here



Landforms of the Meseta border and coastal plain.

reproduced; the smaller one, which might well have been a little larger, so as to use the whole breadth of the page instead of wasting space in blank paper, presents the leading features of the Meseta; namely, tabular forms ("Gour") of dissected horizontal strata, through which rise rounded ridges ("Sokhrat") of the resistant foundation rocks; while a simple coastal plain slopes from a series of abandoned sea cliffs in the western margin of the Meseta to the



Form of a valley in the Meseta.

Atlantic sea cliffs of to-day. The other diagram exhibits on a larger scale the tabular Meseta traversed by an open valley, in which water is "usually to be found, either as a running stream or more commonly oozing out as springs from the valley sides." If Gentil's book had contained a number of such block-diagrams its value would have been thereby much increased.

Physiography as a Basis of Political History.

THE BALKAN PENINSULA. By D. G. Hogarth. *Geogr. Journ.*, Vol. 41, 1913, pp. 325-336.

One of the reasons for regretting the geological scheme of geographical description in Gentil's book, noticed above, is that it does not provide a sufficiently connected picture of physiographic districts, which might afterwards serve as a basis for historical, political or economic studies. The same may be said of many geomorphological studies of the modern German school, in which regional physiographic phrases are often so deeply buried in a mass of geological detail as to discourage any historian or economist from searching them out; it is difficult enough for a geographer to find them! Perhaps it is because of the relative unfitness of modern physiographical material, that so little use of it is made as a basis for studies in other subjects where geographers at least believe it might be useful.

On the other hand, the kind of physiographical basis that some writers do use in their historico-political studies is in certain aspects disappointing, to say the least. Consider, for example, the paper cited at the head of this note. It is an anthropogeographical address by an expert who has devoted the last twenty-five years with little intermission to the exploration, chiefly archeological, of the Near East, and who here proposes to "state the influence which geographical conditions . . . have had on the societies of this Balkan area . . . To do this one must take account of history to some extent; but only so far as history has been conditioned by geography." The interest of the address in the present connection lies in the method adopted in the description of the physical features by which Balkan history is believed to have been conditioned. That a speaker before a general audience should employ a very elementary and wholly empirical method of physiographic description is proper enough, even if the audience represents the general membership of one of the most distinguished geographical societies in the world, for such audiences have no technical understanding of scientific geography; but whether an elementary empirical style should be preserved in the printed record of the address, when published in a leading geographical journal, is open to question. Still, much of the description seems to be sufficiently intelligible for the author's purpose. For example, after describing the so-called peninsula as divided by mountain ranges into several north-south belts, the author says that the greater part of Albania in the western belt consists of "a series of long and very narrow valleys running across . . . from an almost impassable mountain spine at the eastern frontier to the sea, which is fringed with inhospitable malarious strips filling short intervals between high rocky spurs. The flanking ridges confining the valleys are very high and steep. These features are most fully developed in central Albania." Farther south are "short lateral ranges curving back from the main eastern spine and enclosing small plains."

The phrasing of the descriptions is, however, too often vague and variable; if such deficiencies are hardly avoidable in a spoken address, they are easily corrected in its printed form. The use of two terms for one thing, as when the "narrow valleys" that cross the western belt are later described as "long transverse furrows," violates the fundamental principle of using only one term for one thing. Such a phrase as "ranges curving back from the spine" is so indefinite that it must lead to various mental pictures in the minds of

various hearers; "spine" as here used of course means "backbone," and not such a spine as was temporarily formed on Mt. Pelée. "Rough and shaggy hills" and "shaggy hill country" are truly suggestive expressions, but most readers in applying the latter phrase to the dissected uplands west of the Bosphorus will overrate their ruggedness. But the most ill-judged terms are found in the description of certain north-south and east-west mountain ranges as "vertical" and "horizontal"; as if the speaker were a poorly taught schoolboy talking about a map hanging on a wall, instead o a practiced traveler describing the country that he has repeatedly traversed. The phrases in which these blunders occur are as follows:—"The southern part of the peninsula, which is very largely mountainous, displays two orographic features, which have exercised a constant influence on its history and will always control its destiny. In the first place the main lines of its mountainous structure are disposed vertically . . . from northward to southward. In the second place, the slopes leading up to the horizontal mountain system which divides it from the northern part of the peninsula . . . are much steeper than the slopes downwards on the north side of the range . . . Each of the main vertical belts —four in number—into which the peninsula is divided, is marked out by nature, therefore, either to be an independent self-contained unit, or to be combined" etc. That an address delivered in a hall which the speaker referred to as a "temple of exact geography" should describe mountain ranges as "vertical" and "horizontal" is simply amazing. One would think that even a proof-reader might have corrected such errors as these.

The general geographical elements of position and distance by which the Balkan peninsula is related to neighboring countries are well treated in the earlier pages. One of the economic lessons exemplified by several instances falls under the well-known rule that movement tends to follow open lowland paths and that it is blocked by high and rugged mountain barriers. The chief political lesson is that a rough country develops clannishness among the inhabitants of its depressions and basins, and makes centralized government difficult. Both of these lessons would, I believe, have been more effectively taught, had greater emphasis been given to the generality of the rules under which the local instances fall. An interesting ethnic lesson is that religious communion exerts more control than race in grouping the population; but this seems independent of physiographic factors. A point of more physiographic import is that "whatever the Powers may wish, or the Balkan allies extort, or the Turks contrive," the scientific frontier between the parts of Europe and Asia here adjoining lies, not along the water passages between the Black Sea and the Mediterranean, but about fifty miles farther west where the open Rumelian lowland breaks the uplands in which the narrow "trough-like gap" of the Bosphorus and the Dardanelles, in good part drowned river valleys, are relatively narrow interruptions. No wonder that the address was listened to with "enrapt interest" and characterized as "very lucid and instructive," for it treats historical and political topics of live importance to-day; but as anthropogeography it is disappointing in being so largely "anthropic" and so little geographic.

W. M. Davis.

HYDROGRAPHICAL WORK ON THE RUSSIAN SHORES OF THE PACIFIC*

About fifteen years ago a special hydrographical expedition was organized in the Russian Far East for the purpose of surveying the Russian shores of the Bering, Okhotsk, and Japan Seas. The work has been interrupted several times, as, for instance, in 1900, during the Boxer troubles, when the entire force of the expedition had to join the navy; in 1904-1905, during the Russo-Japanese war, when the whole force again joined the navy, and in 1906-1907, when the expedition had no vessel.

The first years after its organization, this expedition worked in Kwantung waters, made a survey of Korea Bay between Port Arthur and the Yalu River, of the mouth of the river and the islands in the bay, *viz.*, Elliot, Blonde and Bourchier. In Liaotung Gulf a survey was made of the western shores of the Kwantung Peninsula and the adjoining islands, and soundings of the shore waters. This work resulted in the making of twenty-two entirely new maps. In 1908 work was continued only about one month, owing to the late arrival of the steamer *Okhotsk*, which was purchased in England.

From 1909 to 1911 inclusive, the expedition made the following surveys on the coasts of Kamchatka, the Sea of Okhotsk, the Gulf of Tartary and the Japan Sea, enumerated in order from north to south. On the eastern coast of Kamchatka the new surveys included Baron Korf Bay (60° N. and 165½° E.), the coast from Cape Ilpinski to Cape Ozernoi (60° to 57½° N.) and from Cape Kronotski to Petropavlovsk (55° to 53° N.), and the harbor of Petropavlovsk and Avatcha Bay, on which it lies. The small peninsula which ends in Cape Lopatka, the southernmost tip of Kamchatka, was also surveyed. Of the western coast of Kamchatka that part which lies between the mouths of the Kambal and Ichi Rivers was surveyed. On the northern coast of the Sea of Okhotsk surveys were made of Yama Bay (59° N. and 155° E.) with detailed soundings for anchorages [this map was listed in the *Bull.* under "Siberian Coasts," (b), Vol. 43, 1911, p. 799], of Eirineisk Bay (59° N. and 146° E.), of the coast from here west to the town of Okhotsk (59° and 143° E.) and of this town and its roadstead. The position of the mouth of the Ooli River [Ulya? (59° N. and 142° E.)] was determined. In the western embayment of the Sea of Okhotsk the strait between Great Shantar and Little Shantar Island was surveyed; also Mamga Harbor (54⅓° N. and 126⅔° E.) on the western side of Tugur Bay. In the Gulf of Tartary detailed surveys were made, on Sakhalin Island, of the following bays: Shastye, Chaivo, Piltun, Pilevo, Tetuhe and Viakhta; and, on the mainland, of De Castries Bay (57½° N.). The reef near Zolotoi promontory was also surveyed and soundings of the western half of the Amur River estuary were made in great detail.

Sixty-eight astronomical and 220 trigonometrical points were fixed and used as a basis for the preparation of maps; 2,000 versts (1,326 miles) of the

* Published from report of Consul John F. Jewell, by kind permission of the Bureau of Foreign and Domestic Commerce, Washington, D. C.

shore line were taken by circumferentor; 300 points were fixed by geodetical methods; 150 versts (100 miles) of the Okhotsk Sea were charted; the soundings made covered 25,000 versts (16,572 miles); 8,000 depths were taken; 10,000 versts (6,667 miles) of soundings, and 280,000 soundings were made from row boats, and about 5,000 soundings were made in ice.

In addition a great deal of work was done in connection with the study of currents, the temperature and the specific gravity of sea water, studies of the flora and the fauna of the sea, studies of terrestrial magnetism and earth refraction, meteorological elements and measuring of the changes of gravity with the Sterneck pendulum.

Being supplied by the Hydrographic Office with necessary instruments and outfit, the expedition established 53 deep water stations at which 97 faunal soundings and researches were made. This work, being done by means of trawlers and dredgings, has produced several thousands of sea animals, which were sent to the zoological museum, Imperial Academy of Science, St. Petersburg, and to the museum of the Priamur District at Khabarovsk. Exact magnetic studies were made at 208 points, and in 173 cases the earth's refraction was determined. The tides were studied at 66 points and tidal currents in 60 places. For the purpose of studying sea currents, 10,000 bottles were thrown into the sea.

In 1912 the expedition continued its work on the northern shores of the Okhotsk Sea and the Amur estuary. A survey of the Okhotsk shores was made from Eirineisk Bay almost up to Ola (151¼° E.) so that this whole stretch of coast is now correctly mapped. In this region detailed surveys were also made of Kulka Bay, Spafarieff (Korovyi) Island, Nagaeff (Volak) Bay, Shestakoff Bay and anchoring places in the mouth of the Ireti. This work is of special interest as it settles the question of harbors in the Okhotsk Sea, where before no safe harbors were known, and changes into a place of refuge a region that was a graveyard for vessels.

New and safe anchorages were found on Spafarieff Island (Bering Bay), and opposite it on the mainland in Shestakoff Bay. The third bay discovered by the expedition was named Nagaeff Bay, in honor of the first Russian hydrographer. In the Gulf of Tartary, Frederic Bay, near DeCastries Bay (51½° N. and 141° E.) was surveyed in detail from row boats. Phusun Bay was also surveyed.

In figures, the work of the expedition in 1912 consisted of the following: Ten astronomical and twenty-six trigonometrical points were fixed; exact magnetical studies were made at twenty-three points; 300 versts (200 miles) of sea shore were measured by traverse, 470 versts (312 miles) by survey from the ship, and 5,000 versts (3,314 miles) by soundings; 2,000 depths were sounded: 1,500 versts (994 miles) were surveyed and 32,000 soundings were made from row boats; the height of 630 points were determined by geodetical surveying, and twenty-nine deep water stations were established; in twenty-one places researches were made by means of trawlers and dredgings; 198 species of animals and 1,100 samples of plants were collected; and in twenty places the earth's refraction was measured 200 times.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

Meetings of the Society. The first regular meeting of the Society for the season of 1913-1914 was held at the Engineering Societies' Building, No. 29 West 39th Street, on Tuesday evening, November 25, 1913. Vice-President Greenough in the Chair. The following persons, twenty-four in number, recommended by the Council, were elected to Fellowship:

William T. Blaine,	John Jacob Rothermel,
Ammi Brown,	Henry Clay Shaw,
Prof. Dr. George Hatjidakis,	Alvin Untermyer,
Mrs. Austin Huntington,	T. Wayland Vaughan,
Charles C. Jackson,	William F. W. Veysey,
C. L. Jainee,	Frederick K. Vreeland,
Miss Mary L. Jobe,	Charles H. Weigle,
Hiram Dyer McCaskey,	William Young Westervelt,
Charles V. Miller,	Guill S. Whitehouse.
John R. Morrow,	Orme Wilson, Jr.,
Miss Mary Proctor,	Clark Wissler,
John Knowlton Robinson,	Charles Zoller,

Professor Hiram Bingham, A.M., Ph.D., of Yale University, then addressed the Society on "The Land of the Incas" with lantern illustrations.

The Rev. Hudson Stuck, D.D., lectured before the Society on Tuesday, December 9, on "The Conquest of Mt. McKinley," with lantern illustrations.

Lectures in January. On January 6, Albert Bushnell Hart, Ph.D., LL.D., Litt.D., Professor of Government in Harvard University, lectured before the Society at the Engineering Societies' Building on "The Balkans and Their Peoples," with lantern views.

The Annual Meeting of the Society will be held on January 20, 1914, at the Engineering Societies' Building. On that occasion Frederic Dean, A.M., LL.D., will give an illustrated lecture on "Porto Rico; Our West Indian Outpost."

The Society's House Open All the Year. Until last summer it was the practice to close the Society's house during August. The experiment of keeping the house open throughout the summer in 1913 was a success. It contributed to the convenience of the work in the building and maintained uninterrupted attention to the needs of geographical workers who have occasion to consult our literary or map collections. The public interest in this innovation was indicated by the fact that 290 persons visited the house in August last. The House Committee, at the November meeting of the Council, recommended that the precedent established last summer be continued hereafter.

Binding our Library Books. Some months ago 5,000 of our library books were sent out for binding. Of these, 3,400 have been returned and distributed to their proper places in the book stacks. The policy of binding all our library material excepting thin pamphlets, which are filed and indexed in pamphlet cases, conduces to convenience in handling the books and to their preservation.

Presented to the Society. A friend of the Society has presented two large framed maps now hanging on the wall in the Exhibition Hall. These are facsimiles of the Royal Spanish World Map about 1523 and the Sebastian Cabot World Map of 1544; also a picture woven in silk of the landing of Columbus, which is on the wall of the reading room.

Exhibition of the Society's Collection of Wall Maps, Atlases and Text Books. The collection was displayed in the rooms of the Rhode Island Normal School, Providence, R. I., during November. The maps were in place for the meetings of the Rhode Island Institute of Instruction and also for the Barnard Club, an organization of the men teachers of the state, and special effort was made to direct the attention of the latter body to the exhibit. Many visitors of standing in the community also went over the collection and expressed high appreciation of the efforts of the American Geographical Society to place this fine material before teachers. As an educative opportunity for the students of the Normal School, the display was well worth the effort, and results from it have already begun to appear.

The general tendency to publish maps of cheaper material without detracting from their effectiveness, and thereby make it possible for a school to select a large number of subjects is a noticeable advance in map work and was a distinguishing mark of the exhibit. The series of maps by Vidal de la Blache is a type of this new idea.

The following notes on the maps for the perusal of visitors helped them to consider the exhibits more intelligently:

NOTES ON WALL MAPS

1. A wall map should display its features in such a way that they can be seen from every part of the room.
   (*a*) A glazed surface, because of the different angles of reflection of light, does not permit of this.
   (*b*) Names in small type, especially if they appear in numbers, tend to confusion.

2. A physical wall map is more valuable than a political. For most countries, as Australia, the political wall map is of slight value.

3. A physical wall map should follow the rules generally accepted by geographers:
   (*a*) A universal color scheme. Lowlands in green, and highlands in brown. Two or more shades of brown may be used, the deeper for greater heights. An intermediate color, white, for uplands may be used.
   Water in blue, the deepest shades for the greatest depths. At least three shades are desirable, to show continental shelf, continental slope and ocean bottom.
   (*b*) The colors should have proper values so that the green or brown be not preeminent.
   (*c*) Localities may be indicated by a large dot or circle. The name may be indicated by the initial letter, a number or by very small type if it can be done without confusion.
   (*d*) Political divisions may be indicated on such maps by heavy (red) lines.

4. The newest idea is to have a single map for a single feature and new maps are being published at a small cost each with this end in view. Note the series by Vidal de la Blache and by Philips.

5. The Mercator Projection of the world which distorts area and shape is being gradually replaced by Mollweide's Homolographic (equal area) Projection which distorts shape only.

6. It is advisable in early grades to use a physical wall map only. Beginning about the sixth grade, the pupils may chart information on a map. With strong training on physical maps, using international colors, it will not be confusing at this stage if pupils color cotton areas, population areas, and the like.

NORTH AMERICA

Local Glaciation of the White Mountains. The Presidential Range of the White Mountains, according to J. W. Goldthwaite (*Appalachia*, XIII, No. 1), owes its most rugged forms to local glaciation before the coming of the general ice sheet. The local glaciers carved the cirques about the crest

that are now known as King's and Tuckerman's Ravines and the Bumpus Basin, among others, all typical, glacial cirques. Above these cirques the mountain forms are pretty much as they were before glacial time, the gentle slopes of a great monadnock above the peneplain of southern New England, which then stood much lower than now. Uplift caused the erosion of the deep normal gullies in which the local glaciers accumulated before the general glaciation. The great ice sheet left moderate but demonstrable effects—striation of ledges, moving of blocks, and especially the importation of ground moraine into the north facing cirques. The paper is admirably written and illustrated.

MARK JEFFERSON.

Rainfall Data for Botanists. The standard rainfall data usually included in climatological reports are often insufficient for botanists. Annual and monthly means of rainfall are all very well as far as they go, but they do not go far enough. It has been shown that the rainfall averaged by the crop year bears a much closer relation to the crop yield than does the average for the calendar year. And, twenty years ago, Dr. Gustavus Hinrichs showed, in his analysis of rainfall at Iowa City, how important it is, in correlating rainfall and crop yield, to consider the character of the rainfall, as well as the amount. The seasonal rainfall amounts are not usually included in climatological reports, yet these, rather than the annual and monthly amounts, are often the determining control of vegetation.

Dr. R. M. Harper, in a recent report on the Economic Botany of Alabama (*Geol. Survey, Ala., Monograph 8,* 1913), says that there is a general correspondence between hardwood forests and regions of heavy winter rains (Dec.-Feb.), and between the principal long-leaf pine area and heavy summer rains (June-Aug.). In another paper, entitled "A Botanical Cross Section of Northern Mississippi, with Notes on the Influence of Soil on Vegetation" (*Bull. Torrey Bot. Club,* Vol. 40, No. 8, 1913), Dr. Harper attributes the absence of certain bog plants from northern Mississippi to the seasonal distribution of rainfall there. Over the pine barren portions of the coastal plain the increased rainfall of summer largely counterbalances the higher evaporating power of the summer sun. Hence the water level is more uniform there, and conditions are favorable for the development of peat and of bog plants. Again, in a discussion of "The Forest Regions of Mississippi in Relation to the Lumber Industry" (*Southern Lumberman,* Nashville, Tenn., Aug., 1913), the same author points out that, while pines and evergreens are practically unknown in the northern half of the state, the south, where the summers are wetter, has a good deal of short leaf pine. These various references to the seasonal rainfall as a controlling factor in the distribution of vegetation indicate once more the need of attention on the part of climatologists to the requirements of their fellow-workers in other branches of science.

R. DEC. WARD.

Has Climate Changed in New Mexico? In a report upon "Climate and Evidence of Climatic Changes," forming part of an account of "The Physiography of the Rio Grande Valley, New Mexico, in Relation to Pueblo Culture" (*Bull. 54, Bureau of American Ethnology, 1913*), Messrs. Junius Henderson and Wilfred W. Robbins conclude that the various lines of evidence, botanical, archæological, historical, physiographical, which they have investigated point to a progressive desiccation of the region since the beginning of the pueblo and cliff-dwelling period. They find "no important evidence inconsistent with this view," but are careful to say that the change in population may possibly be ascribed to other causes. The authors believe that, if such desiccation has occurred, it was accompanied by numerous slight fluctuations in climate, and must have been "infinitely slow." The evidence of recent desiccation is not regarded as conclusive. Several suggestions are made for future work, and it is clear that the question of progressive climatic change is not regarded as settled.

R. DEC. WARD.

A Periodical Devoted to New Mexico. In July last the first number of a quarterly magazine entitled "Old Santa Fe, a Magazine of History, Archæology, Genealogy and Biography" was issued by the Old Santa Fe Press.

Its editor is Ralph Emerson Twitchell, whose work in two volumes "The Leading Facts of New Mexican History" was reviewed in the April and October numbers of the *Bulletin.* Associated with Mr. Twitchell are eight of the leading writers on those phases of New Mexico to which the magazine is devoted. The contents of the first two numbers give promise that the magazine will be a valuable record in this rich field for research. Among the works for publication is the Spanish manuscript collection of the Historical Society of New Mexico, translated and annotated.

The Prince of Monaco's Visit to This Country. Albert I, Prince of Monaco, the well-known oceanographer, spent a few weeks in this country in September and October. A dinner in his honor had been arranged by the American Geographical Society and the American Museum of Natural History, but owing to the inability of the Prince to reach New York from the Far West at the only convenient time, the projected dinner was reluctantly abandoned. A lecture by the Prince, under the auspices of the New York Academy of Sciences, was given at the American Museum of Natural History which kindly sent tickets to the Fellows of the American Geographical Society.

About 2,000 persons heard the lecture on Oct. 27. After referring briefly to the foundation of the Musée Océanographique in Paris and the publication of the Carte Générale Bathymétrique des Océans, the Prince devoted the greater part of the evening to a description of his numerous cruises and their results. With the aid of lantern slides and motion pictures he described the various observational methods employed by his staff (for a description see "L'Océanographie" by J. Richard, Paris, 1908, reviewed in the *Bull.*, Vol. 41, 1909, pp. 127-128). These included deep sea soundings, the determination of the physical properties of ocean water, color, salinity, temperature, density, etc., the charting of currents by means of objects set adrift, the investigation of the upper atmosphere by means of *ballons sondes* and, primarily, the study of the life of the ocean. The investigation of his staff in the latter domain, the Prince said, had led to various important discoveries. Among them was the fact that, contrary to former belief, organisms living at the greatest depths were capable of rising to the surface without harm, in spite of the great decrease in pressure. Such organisms had frequently been taken in dragnets on the surface at night. Referring to the wealth and variety of organisms disclosed in great depths the Prince expressed the belief that life on the earth had its origin in the depths of the sea and not on land.

The motion pictures gave a realistic idea of the various activities of an oceanographical cruise. Some showed how soundings are taken, some how dragnets and trawls are lowered and how their contents are examined after they have been raised again, some showed the release of balloons and box kites with meteorological apparatus for the observation of the upper air. The final motion picture, which dealt with a whale hunt, showed every stage of the chase from shooting the whale with a harpoon gun and hauling it on board by means of a winch to its dismemberment by the scientific staff, which included the opening of the stomach and the finding in it of valuable and unknown fish and other organisms.

SOUTH AMERICA

The Vegetation of Southernmost South America and the Sub-Antarctic Islands. On November 17, 1913, Dr. Carl Skottsberg, professor of botany at the University of Upsala, Sweden, lectured on this topic before the New York Academy of Sciences. He described the vegetation of the region of heavy rainfall on the west slope of the Andes from about lat. 41° to Cape Horn, the dry eastern slopes in the same latitude, the Falkland Islands, the island of South Georgia, and the edge of the Antarctic Continent. The Chilean forest is said to be the only cold-temperate rain-forest in the world. It is very dense, and the trees are mostly broadleaved evergreens. Among the mountains where the climate is a little drier a species of *Libocedrus* (a genus represented also in our Pacific Northwest) forms small groves which are the only analogue in the southern hemisphere of the great northern coniferous forests. The Patagonian side is mainly treeless, and the vegetation is characterized by grasses and a large number of plants which form dense tough

cushions, a type which is also frequent in New Zealand. The Falkland Islands are windy and treeless and covered with peat. Much damage has been done to the native vegetation by sheep in the last sixty years. South Georgia has snow most of the year, and only nineteen species of flowering plants. Bare rocks on the edge of the Antarctic Continent support two species of flowering plants and about fifty mosses. R. M. HARPER.

AFRICA

First Longitude Determination by Wireless in French West Africa. An account of the first wireless determination of longitude in French West Africa is given by Messrs. Schwartz and Villatte in *La Géographie* for Sept. 15, 1913 (Vol. 48, No. 3, pp. 137-146). The time observations were made at Konakry and Kissidugu. A mean difference of 14′ 22.79″ was determined between the two localities. The work was divided into three stages. The first consisted of astronomical observations taken at the two stations. This was followed by comparison of the Kissidugu chronometer and the Konakry electromagnetic clock by means of Hertzian signals sent from the last named place. A final set of astronomical observations was required to complete the task. The Kissidugu receiving station consisted of an antenna provided with 5 aerial wires, each 50 meters in length, for which 2 millimeter bronze telephone wires were used. This contrivance rested at one end on a mast-head 20 meters high and an 11-meter pole placed on top of a tree at the other. The antenna was connected with a receiver specially constructed to enable detection of the beats of the chronometer and the ticking of the sending station.

Agriculture in the Oases of Tripoli. Great effort is being made by the Italian government to promote agriculture in its newly acquired African colonies. According to the *Rivista Coloniale* for Sept. 15, 1913 (Vol. II, No. 5, p. 129), the colonial authorities have recently passed a decree by which owners of orchards in the oases of Tripoli, including the districts of Menscia, Zanzur and Tagiura, were summoned to re-occupy their lands before Sept. 30th, 1913. The government is anxious to insure abundant crop returns for the ensuing year and the decree stated that failure to comply with its provisions would result in the properties being farmed out. This, however, would be undertaken for the account of their owners.

Sahara Dust over the Atlantic. The portion of the Atlantic Ocean between the Canary and Cape Verde Islands was called *mare tenebrosum* by Edrisi in the twelfth century, because of the frequent darkening of the sky in that region by dust. The atmosphere was known to be so turbid at times as to make navigation by the vessels of those days dangerous. In the middle of the last century, Ehrenberg made a painstaking investigation of the origin of this dust, and published a series of papers on the subject in the *Mitteilungen* of the Berlin Akademie der Wissenschaften, in which he stated his belief in the South American origin of the dust. In 1878, Hellmann published an important paper ("Ueber die auf dem Atlantischen Ozean in der Höhe der Kapverdischen Inseln häufig vorkommenden Staubfälle," *Monatsber. Berl. Akad. Wiss.*, 1878, 364-403), in which the meteorological and geographical aspects of this phenomenon received special attention. Ehrenberg's view as to the non-African origin of the dust was there shown to be mistaken. Two of the points made by Ehrenberg against the African origin were (1) the fact that the Sahara sand is white, while the dust is really reddish; and (2) that the easterly winds necessary to carry this sand to the Atlantic are not present. These two points are now taken up by Hellmann in a recent paper ("Ueber die Herkunft der Staubfälle im 'Dunkelmeer,'" *Sitzungsber. kgl. preuss. Akad. Wiss.*, XIV, 1913), and the most recent observations from the western Sahara are drawn upon for information. Hellmann clearly establishes the fact that the easterly winds which are necessary for the transportation of the dust to the Atlantic exist over the district in question, and, further, that there is an abundance of reddish sand over the inner portions of both the Saharan and Libyan deserts. Thus two of the remaining inaccuracies of Ehrenberg's discussion have been satisfactorily cleared up.

When meteorological conditions are favorable, the districts along the margins of the great deserts of the world very commonly receive large amounts of dust. Along the eastern coast of Asia the northwest winds of winter bring so much sand from the deserts and loess areas of the interior that these winds are called "yellow winds" over the lowland of Peking-Tientsin, and also quite generally in Mongolia. This dust is occasionally carried far out to sea.

R. DeC. Ward.

ASIA

The Service Géographique de l'Indo-Chine in 1912. Topographic work was undertaken between the Annam mountains and the Mekong lowland. Part of the region connecting Laos and the sea was surveyed for the first time. In Cambodia two field parties were at work gathering data for maps on a scale of 1:40,000 and 1:80,000. This work precedes more detailed surveys which will be made in connection with a proposed railroad to Sisophon. A field party was also at work in northern and southern Annam respectively. Mapping on a scale of 1:20,000 progressed along the deltas of the Phan-Thiêt and the Phan-Ri as well as in the Thanh-Hoa region. Two field parties in Laos completed the triangulation network for mapping, this year, on a scale of 1:80,000, the region which will be traversed by the railroad connecting Quang-Tri and Ka-Bai. A third party began preliminary geodetic work in the recently annexed province of Siem-Reap.

The work on hand in the cartographic department of the institution was varied. Six of the 1:25,000 sheets which were revised in 1911 were published. The Bac-Ninh sheet of the 1:100,000 general map was partially revised. Sheets of the environs of Hanoi and Saigon on a scale of 1:50,000 were published. In addition, maps were compiled for different government bureaus. Among the noteworthy sheets in this category are the geological map of Eastern Yunnan on a scale of 1:500,000 and various large scale plans for the use of the Artillery Corps.

The annual report published by the Service Géographique de l'Indo-Chine contains succinct topographic, geologic, ethnographic and economic descriptions relating to each sheet of the region surveyed in 1912.

A New Depression in Western Asia Attention is called in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin* (No. 8, 1913, p. 641) to a hitherto unknown depression in Mesopotamia, the bottom of which is occupied by a lake whose surface is about sixteen feet below sea-level. The sunken area is sixty-three miles northwest of Bagdad. It was discovered during the surveys by engineers of the Mesopotamian Irrigation Mission between 1909 and 1911. The leveling undertaken by this expedition has thrown considerable light on the topography of lower Mesopotamia. Unfortunately the presence of hostile Arabs near the lake prevented surveying from being extended around its entire periphery. Its eastern end alone could be determined through measurements, which, starting from near Saklawie, were carried northward to about ten miles west of Sabkha. According to a statement on Map No. 2 of "Plans of the Irrigation of Mesopotamia" by Sir Wm. Willcocks, it is believed that the depression is very long as the Tharthar River terminates at its northern end.

EUROPE

Depth of the Ejecta of the Eruption of Mt. Vesuvius in 1906. By means of photographs taken from the same spot in 1904 and 1913 Dr. P. Schlee in the October number of the *Geographische Zeitschrift* (Vol. 19, 1913, No. 10, pp. 577-578) calls attention to the filling up of the Atrio del Cavallo—the depression which lies on the inner side of the old crater rim of the Monte Somma, between it and the northern slopes of the new cinder cone of Mt. Vesuvius—by the ejecta of the volcano during the violent eruption of April, 1906. To the detritus normally brought down by the erosion of the new cinder cone was added the greater part of the lapillæ of this eruption, as these were projected in a northeasterly direction. The inner wall of the old crater rim, at the two points of which comparative photographs were taken, had a height, prior to the eruption of 1906, of 456 and 607 feet respectively, according to the official

map on the scale of 1:10,000 of the Italian Military Geographical Institute. To judge by the present position of the floor of the Atrio del Cavallo the wall at these two points is now approximately 325 feet and 500 feet high. The depth of the accumulations due to the eruption of 1906 would, therefore, be roughly 130 and 110 feet at these points. An additional criterion for the determination of this depth is afforded by comparing the recent detailed map of Mt. Vesuvius on the scale of 1:10,000 by A. Castiglione published in *Petermanns Mitteilungen* in November, 1912 (see *Bull.*, Vol. 45, 1913, p. 79, under "Italy" and p. 320 under *Erratum*), with the official Italian map just referred to. On Castiglione's map the floor of the Atrio is 100 feet and 80 feet higher respectively at the two points in question than prior to the eruption of 1906. Although Dr. Schnell considers these figures too small, he points out that accurate figures are of no consequence because the depth of the ejecta varies in different parts of the Atrio. They are sufficiently correct, however, to convey an impression of the amount of material thrown out by the eruption of 1906.

Cartographic Work of the Ordnance Survey during 1912-1913. The completion of all the field work for the survey of Ireland on a scale of 1:2,500 is announced in the Report of Progress of the Ordnance Survey for the year 1912-1913. Most of this survey has been published and it is expected that by the end of December, 1914, the whole will be available in printed form. At present all of the United Kingdom, with the exception of waste and mountainous areas, has been surveyed on this scale. This country is therefore the only one in the world "of which large scale cadastral maps are available for the whole cultivated or occupied surface."

Influence of the New Balkan Frontiers. Recent boundary adjustments in the Balkans are causing racial migrations. The movement is particularly noticeable along the Greco-Bulgarian frontier. This part of Macedonia was peopled by Greeks and Bulgarians before the war. The Greeks, however, were distributed mainly in the cities, while the Bulgarians represented the rural element in the population. These Bulgarian farmers and peasants are now leaving Greek territory and emigrating to the adjoining Bulgarian districts. On the other hand, the Greek merchants and traders of the Macedonian towns assigned to Bulgaria are leaving their homes to settle in the newly acquired Greek territory. A similar movement is taking place, though to a lesser degree, along the Greco-Servian boundary.

LEON DOMINIAN.

Navigational Exhibit of the Deutsche Seewarte. Under date of October, 1913, the Deutsche Seewarte of Hamburg announces that the collection of models, nautical instruments and drawings gathered by its first director, the late Dr. Neumayer, has again been placed on view. The collection is to be increased by a selection of nautical instruments, both those used in the merchant marine and in the navy, oceanographical and meteorological instruments. The collection will aim to be critical rather than comprehensive.

Le Congrès International d'Ethnologie et d'Ethnographie. The International Congress of Ethnology and Ethnography will meet at Neuchâtel, Switzerland, June 1-5, 1914.

POLAR

The Stefansson Expedition. A dispatch from Vilhjalmur Stefansson to the New York *Times* dated Point Barrow, Alaska, October 30, said that the *Karluk*, his largest vessel, beset in the ice, drifted towards the north past Point Barrow on August 8. On the same day, however, she got free of the ice, but was again beset in the heavy pack on August 12 about 15 miles off shore in long. 147° W. On August 17 she was free once more and drifted with the wind parallel with the coast till September 10. She stopped drifting in lat. 70° 47′ N. and long. 150°7′ W., not over 35 miles north of the Alaskan coast and about 140 miles south of east of Point Barrow, a little east of north of the mouth of the Colville River. Believing the *Karluk* was then fast in the ice for the winter Stefansson left the ship with Cook, Genness, Connell, Wilkins and two Eskimos to go ashore and secure a supply of fresh meat. He had two sleds and twelve dogs.

Two days later a northeast gale broke up the ice. There was a dense fog, and Stefansson says he does not know whether the ice carried the *Karluk* west or whether it freed her so that she could make progress to the east. At all events she should be safe as the wind opened the ice pack and the *Karluk* therefore was not under pressure. There were 25 persons including Captain Bartlett aboard the ship.

Stefansson proceeded to Point Barrow where he learned that his vessels *Alaska* and *Mary Sachs* were both safe and were wintering at Collinson Point. His steam whaling bark *Belvedere* was safe behind grounded ice three miles off shore near the 141st meridian. He expected to leave Point Barrow on November 3 and travel east along the coast. None of the plans of the expedition have been abandoned. They are merely delayed.

In a despatch Stefansson sent to the Canadian Government he says that he is planning an ice expedition to the Mackenzie Delta, making surveys and taking soundings for steamer routes. He thinks the *Karluk* has drifted west with the ice. There is no reason as yet to fear for the safety of the expedition or the ultimate carrying out of its plans. The *Karluk* is a seaworthy boat specially strengthened to resist ice pressure.

The 1913 Scientific Campaigns in Spitzbergen. During July and August of this year three parties were engaged in topographic, hydrographic, and geologic surveying. Investigations were confined to the district lying between Ice Fiord and Van Mijen Bay. According to C. Rabot, in *La Géographie* (Vol. 48, No. 3, Sept. 15, 1913, pp. 194-195), the 1:50,000 map of this peninsula was completed during this season. Attention has been called to this map in a recent number of the *Bulletin* (Vol. 45, No. 6, June, 1913, p. 450).

Hydrographic work included examination of the southern shores of Ice Fiord around Green Harbor and the determination of banks within a distance of 5 miles off shore along the western coast between the entrances to Ice Fiord and Bell Sound. One of these banks was discovered about four miles from land at a depth of two meters.

The region which is thus being investigated is the site of a settlement as far north as that occupied by the Eskimos at Etah, northwest Greenland. The discovery some twelve years ago of extensive coal beds in the vicinity of Advent Bay led to the founding of Longyear City on its shores. This mining camp is provided with a car-line and an electric plant. Its population consists of about 200 miners, the majority being Scandinavians.

Green Harbor is an important point in the whaling industry. Its commodious bay provides a favorable base for whaling boats. An oil plant is in operation in its vicinity. This outpost of civilization is connected by a wireless station with Scandinavia.

LEON DOMINIAN.

The Magnetic South Pole. Recent wireless despatches from the Australian South Polar Expedition bring the news that the Magnetic South Pole has not yet been exactly located. The statement had been accepted that its position was determined in 1909 by Mr. David of the Shackleton Expedition. It appears, however, from recent investigations by Dr. Mawson that while David was really within the area where the magnetic needle from time to time assumes a vertical position, he was not in the center of this area, which is evidently much larger than has hitherto been supposed. There are probably several local poles distributed around the magnetic chief pole; and Dr. Mawson believes that he has been in the neighborhood of one of them in the southeastern part of Adelie Land. (*Zeitschr. Gesell. für Erdk. zu Berlin*, No. 7, 1913, p. 571).

OCEANOGRAPHY

A Proposed International Reconnaissance of the Atlantic Ocean. Messrs. O. Petersson and C. F. Drechsel, vice-president and general secretary of the *Conseil Permanent International pour l'Exploration de la Mer*, were intrusted with the task of drawing up a programme outlining the organization of an international survey of the Atlantic Ocean. A working plan prepared by them was, in September, 1913, issued as a Memorandum from Vol. XVI of the publications of the Permanent International Council. The writers say that a systematic hydrographical and biological investigation of the entire

Atlantic is a task too great to be now attempted. They therefore confined their attention to the part of the Atlantic beginning with the submarine zone of relief known as Telegraph Plateau, between lats. 50° and 55° N. and extending southward to lat. 10° N. As a north-and-south ridge divides the basin of the Atlantic into two great depressions in which hydrographical conditions differ it is advisable to survey each of these depressions independently. They suggest three lines of transatlantic investigations. The northernmost is across Telegraph Plateau between the Orkney Islands and the easternmost projection of the Newfoundland Bank. The depths here range between 1000 and 3000 meters, and the so-called Gulf Stream Drift would be traversed by the section.

Then two southern lines of survey are suggested for the investigation of the longitudinal deeps. The northernmost starts from the mouth of the English Channel and is directed north of the plateau of the Azores to the Caribbean Sea. The western deep is crossed diagonally by this section between latitudes 45° and 20° N. The taking of soundings of the Nares and Porto Rico Deeps is thus made possible. The other proposed route is between the Strait of Gibraltar and the island of Trinidad. This line, passing south of the Azores plateau, would permit observation of the eastern depression. The Moseley Deep, the central submarine ridge and the Sargasso Sea might then be investigated concurrently.

The investigation of coastal seas is also recommended. Ice conditions should be studied east and west of Greenland. A detailed survey of the northeastern Atlantic should be carried on from Iceland and the Faroe-Shetland ridge to Spitzbergen and Novaya Zemlya, including the North Sea, the Skagerak, the Kattegat and the Baltic. So far no hydrographical section through the Labrador Current has been obtained. The study of the waters on the Newfoundland Bank and adjacent areas is of special interest as it deals with the zone of conflict between the Gulf Stream and the Labrador Current.

It is suggested that cruises three months apart be made simultaneously in these various fields of observation so as to survey conditions existing throughout the whole year in the Atlantic Ocean. Practically all oceanographic investigations in the northern section of the Atlantic have been made during the summer or fall. A comprehensive view of conditions throughout the year must first be ascertained before direction can be given to more specialized researches.

So broad a programme can be carried out most profitably with the cooperation of the various governments whose citizens are interested in navigation and fishing in the regions examined. It is suggested that vessels sent to represent European governments at the inauguration of the Panama Canal in 1915 be equipped with all the apparatus needed to prepare hydrographical sections along their routes. These preliminary operations should be confined, in the opinion of Messrs. Petersson and Drechsel, to the zone between the surface and a depth of 1000 meters, in which food fishes and plankton thrive.

This subject has received attention at the meetings of the International Geographical Congresses. At London in 1895 and at Berlin in 1899 resolutions were passed recognizing the economic importance of oceanographical reconnaissances. At Geneva in 1908 a special commission bearing the title of "Commission internationale de l'Atlantique" was appointed, with H. S. H. Prince Albert of Monaco as its president. At the Tenth International Geographical Congress in Rome, 1913, a resolution was passed recommending preliminary exploration in the North Atlantic to throw light on the dimensions and nature of periodical variations of water layers found between the surface and a depth of 1000 meters. Temperature and salinity observations at the surface as well as more extended investigation of currents was also urged.

PERSONAL

Mr. N. H. Darton of the U. S. Geological Survey has recently returned to Washington after a long geological exploration in New Mexico.

An appropriation from the Shaler Memorial Fund of Harvard University has been granted to Professor W. M. Davis to defray, in part, the expense of his trip to the South Pacific to study the physiographic evidence relating to the problem of coral reefs.

Professor Julius Hann, the eminent climatologist of Vienna wishes to find

a purchaser for his meteorological library, which has accumulated on his hands far beyond his power to take care of it properly. Owing to the fact that he has to live on a pension, since he was retired from active government service and is obliged to live in small quarters, the greater part of his library is already packed away in boxes. His great collection of books and separates will be a fine addition to the library of any institution that desires to complete its collection of books bearing on meteorology and climatology. (*Science*, No. 987, Vol. 38, 1913, p. 768.)

Dr. H. R. Mill, director of the British Rainfall Organization, has been compelled to take a complete rest for a time on account of his eyes, which have been affected by the continual strain of his work. He will leave in November for a voyage to New Zealand, and is advised not to attempt to take up for at least a year any work which involves close attention. It is hoped that the rest and change will have a decidedly beneficial effect upon Dr. Mill's eyesight and general health. (*Nature*, No. 2296, Vol. 92, 1913, p. 272.)

OBITUARY

Alfred Russel Wallace. This distinguished naturalist died in England on November 7, 1913, in his 91st year. For sixty-four years he had been in active service as scientific explorer, thinker and writer. In 1845 he invited Henry W. Bates, a fellow naturalist, to accompany him on his four years' journey to the Amazon and the Rio Negro (1848-1852). Bates, himself a naturalist of great ability, inspired Wallace with his own zest for searching out the wonders of insect life, a subject which Wallace finally made his own. His "Narrative of Travels on the Amazon" was published in 1853. Between 1854 and 1862 Wallace traveled in the eastern part of the Dutch East Indies. The vast array of facts he collected on the natives, forests, birds and mammals and the generalizations he evolved from his data given to the world in his "The Malay Archipelago" established his fame as a scientist of the first rank. Darwin and Wallace each worked out the problem of evolution independently and before Darwin had published his idea he received a long letter from Wallace telling of the same discovery as it had come to him. Sir Joseph Hooker and Prof. Lyell brought the two independent manuscripts together and there was thus a joint publication of the discovery.

Among Wallace's voluminous later writings the world was most attracted to "The Zoological Geography of the Malayan Archipelago" (1860) in which the author announced his discovery of the Bali-Lombok boundary line (now commonly known as the Wallace Line) between the Asian and the Australian zoological regions. "The Geological Distribution of Animals" (1876) and "Island Life" (1881) gave Wallace rank as the founder of the science of zoogeography; and in "Tropical Nature" (1878) he reviewed the whole subject of the colors of animals in relation to natural and sexual selection.

Wallace also took great interest in some phases of social and economic problems. Among his later essays were papers on "The Nationalization of Lands" and "Studies, Scientific and Social"; and his last published essay "Social Environment and Moral Progress" appeared in 1913.

Resolutions Adopted on the Death of Ex-Councillor Hermann C. von Post. At the meeting of the Council, on Nov. 20th, the following resolution relating to the death of Mr. Hermann C. von Post was adopted:

"*Resolved:* That by the death of Mr. Hermann C. von Post on October 10, 1913, the Society has lost one of its oldest and most valued members. He became a Fellow of the Society in May, 1875, and in January, 1902, a member of the Council, from which he retired in December, 1910, because of advancing years, greatly to the regret of his colleagues. During his long period of service he was assiduous in his attention to the duties of Councillor. His great experience and excellent judgment made his advice most valuable; and his unfailing interest and loyal support were united with great liberality whenever assistance was needed. The zeal of the active workers in the Society was stimulated by the assurance of his cooperation at all times and his loss is felt by his fellow members as that of a long attached friend as well as colleague. We tender to his family our sincere sympathy in their affliction, and we direct the Secretary to forward to them a copy of this minute."

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch)

NORTH AMERICA

Down the Mackenzie and up the Yukon in 1906. By Elihu Stewart. 270 pp. Map, ills. John Lane Co., New York, 1913. $1.50. 7½ x 5½.

Volumes continue to come from the press describing the wonders, the hazards and the beauties of northwestern North America. Some are worth while and some might better have been unwritten. This book belongs to the former class. It is a vivid description in simple but forceful style of Canada West. One does not feel exaggeration cropping out at any point in the discussion. On the other hand the reader can readily realize himself moving down the Mackenzie and up the Yukon encountering the same experiences, the same thrills met by the author.

The author visited this region as Superintendent of Forestry for Canada and bases his account upon his official report to the Canadian Government in 1906. However, technicalities are omitted except in Part II, where "a few brief general observations on certain characteristics and productions of the country" are discussed under 12 headings. An excellent map of Western Canada shows the route of the author. EUGENE VAN CLEEF.

The New Immigration. A Study of the Industrial and Social Life of Southeastern Europeans in America. By Peter Roberts. xxi and 386 pp. Index. The Macmillan Co., New York, 1912. $1.60. 8 x 5.

Immigration. A World Movement and Its American Significance. By Henry Pratt Fairchild. xi and 455 pp. Index. The Macmillan Co., New York, 1913. $1.75. 8 x 5½.

During the first seven months of 1913 over 750,000 immigrants arrived in this country and the high-water mark of 1,285,349 in 1907 may be exceeded when the record for the year is computed. Most of these new comers settle in the northeastern United States. While many of the foreigners may be poorly prepared to adapt themselves to conditions of living here, it is likewise true that our nation is not accepting all the opportunities and duties which this influx of people begets. These two books, much alike in their purpose but different in treatment, present the problems of immigration. Dr. Roberts's book is an inductive study, and he has collected many facts touching every phase of immigration, including the home leaving, the journey, arrival, conditions of work, of home, of societies, church and politics and the problems of assimilation from which the reader may derive his own conclusions. The author is a firm believer in immigration.

The book by Fairchild is a sociological study. The coming of many Europeans to America is treated as a phase of the movements of peoples throughout the history of the human race; and after a discussion of the present stage, which is not essentially different from the treatment by Roberts, the author presents a concise and scholarly summary of the nature of the problem. It seems almost self-evident that the people among whom the immigrant settles should be most interested to understand the new neighbors. Unfortunately this is not the case, largely perhaps because of the lack of opportunity; but this want is now filled by the admirable presentation of this live question in these two volumes. ROBERT M. BROWN.

Bewölkungsverhältnisse und Sonnenscheindauer von Nordamerika. Von Arthur Gläser. 63 pp. Diagrams. *Archiv der Deutschen Seewarte,* Vol. 35, 1912, No. 1. Hamburg, 1912. Mk. 4.50. 12 x 9½.

Teisserenc de Bort (1884), Greely (1891) and K. McR. Clark (1911) studied and charted the cloudiness of the United States. In two cases (Greely and Clark) we have had monthly as well as annual isonephs. Now comes a new publication by Arthur Gläser, prepared as an "Inaugural-Dissertation" at the University of Leipzig, in which we have by far the most complete discussion of the cloudiness and sunshine of North America which has yet been attempted. All available material has been drawn upon; the data have been subjected to critical comparison, and an unusually large number of charts and diagrams has been prepared. Thus, under cloudiness, we have charts showing the monthly, seasonal and annual isonephs; annual variation; seasons of maximum and minimum cloudiness, and diagrams of isopleths for longitudes 80°, 90°, 100° and 110° west, and latitudes 32°, 40° and 47° north, as well as for the west and east coasts. The accompanying discussion is unusually complete, and takes up the causes of the variations in cloudiness, as well as the facts of variation. Our only comment on these excellent charts would be that it might perhaps have been wiser to omit a good many of the local isonephs in cases where the area concerned is small. Recorded amounts of cloudiness depend to so considerable an extent upon the personal equation of the observers, and the possibility of drawing these local isonephs is determined in so many cases by the fact that there happens to be a station in that particular locality, that to include the smaller details seems to us to give a less accurate rather than a clearer and more accurate view of the actual distribution of cloudiness.

Sunshine in North America has received even less attention in the past than cloudiness, for the reason, doubtless, that the data are far less complete, and are also more recent. Van Bebber's chart (1896) is well known because of its having been included in Bartholomew's *Atlas of Meteorology.* Dr. Gläser has given us charts showing the mean hourly duration of sunshine for each month and for the year; monthly isohels (per cent.) and the annual variation in these percentages; seasons of maximum and minimum cloudiness; mean duration of sunshine in hours of the day for each month; daily march of sunshine for summer, winter and the year, and still other charts. In addition, diagrams showing the distribution of sunshine, by means of isopleths, for the same latitudes and longitudes as in the case of cloudiness, are included.

The mere enumeration of these various charts and diagrams will serve to indicate the thoroughness with which the whole investigation has been carried out. Dr. Gläser has made one of the notable contributions to American climatology. R. DeC. Ward.

An Illustrated Flora of the Northern United States, Canada and the British Possessions from Newfoundland to the Parallel of the Southern Boundary of Virginia, and from the Atlantic Ocean Westward to the 102d Meridian. By Nathaniel L. Britton and Addison Brown. 2nd edition, revised and enlarged. Vol. 1: Ferns to Buckwheat. xxix and 680 pp. Vol. 2: Amaranth to Polypremum. iv and 735 pp. Vol. 3: Gentian to Thistle. 637 pp. Index. Ills. in each. Charles Scribner's Sons, New York, 1913. 11 x 7½.

Students of American plant geography, as well as other groups of botanical workers, will find the new edition of this well-known work very valuable, even indispensable in many cases. To the phytogeographer and the plant ecologist the book is especially well suited, serving them as a highly authoritative index and catalogue of the plant forms with which they have to deal. By the aid of line drawings which accompany each species description, the labor of plant identification is very greatly reduced, thus allowing the results of special taxonomic study to be employed with considerable readiness by non-taxonomic workers. This feature of the work before us has already proved itself in the first edition.

The geographical area embraced by this descriptive catalogue of native and naturalized ferns and seed-plants is given in the title. The whole of Nebraska is included. The notes upon distribution, however, frequently refer

to geographic limits beyond those mentioned. These notes, while appearing very vague and unsatisfactory to the student of vegetational distribution, are doubtless about as definite as the present status of knowledge will permit, and such students will be thankful for what is given.

The information upon habitats is not by any means so pleasing as that concerning geographical ranges. It is a remarkable fact that little if any improvement in the characterization of plant habitats in such books as this seems to have been attempted for many decades, and no attempt in this direction is here evident. Habitat conditions are frequently not mentioned at all, and where they do find place the terms employed are usually very indefinite and carry but little meaning; it appears that these habitat notes have been allowed to find their way into the work without critical attention. Thus, the thirteen species of *Sparganium* here dealt with apparently occur in eleven different categories of habitats, the latter being described as follows: "In marshes and along streams," "in bogs and shallow water," "in low grounds or ponds," "in ponds and streams" (three species so noted), "in lakes and streams," "in marshes and rivers," "in bogs," "in swamps and on muddy shores," "in ponds and marshes," "in slow streams and ponds," and "in ponds and cold lakes." For another illustration of the prevalent futility of these habitat notes, out of the twenty-five species of *Quercus* that are listed six are given without any intimation of the sort of habitats in which they are to be found, six others are said to occur "in dry soil," and the remaining thirteen occur:—"in moist ground"; "in clayey soils"; on "borders of swamps and streams"; "in sandy or rocky soil"; "along streams and swamps"; "in swamps and along streams"; "in rich soil"; "in moist or swampy soil"; "in moist soil"; "in dry soil, preferring limestone ridges"; and "in dry sandy or rocky soil." Such examples as these lead the student of plant distribution to an appreciation of the almost untouched newness of his field of work and to the conviction that the whole problem of the relation of plant form to environmental conditions remains to be explored. Considering the historical development and present nature of botanical science, these remarks are not to be taken as adverse criticism of a work written by taxonomists for taxonomists; nevertheless the question may be logical and permissible, *if* habitats are to receive attention at all in such a work as this, then why not strive to have these notes at least logically clear and perhaps as definite as present knowledge will allow? To the general student of plant phenomena it may appear that habitat characters are as interesting and important as are the conventional morphological descriptions of the plants themselves. It may be hoped that with the appearance of a third edition of this important work (and there will assuredly be a third edition), the ecological view-point may have become general enough so that the present naive and often well-nigh meaningless habitat descriptions may be displaced by others more worthy of the name of science.

As to the plant names employed in the "Flora," there are probably many who will still prefer to cling, in numerous instances, to binomials other than the ones here set down. The writers have followed the "American code" of nomenclature, but the once strange and fearsome workings of this code have already become familiar to at least the younger generation of American botanists. What may be the outcome of the persistent disagreement among taxonomists, in regard to nomenclatorial codes, may not yet be prophesied, but there can be little doubt that the success which has been achieved by the "Illustrated Flora" in its first edition and the further impetus now given by the second edition, will render a possible displacement of the binomials here employed a very slow and arduous process,—if, indeed, such displacement be destined ever to occur. The patent fact seems to be that there are now simultaneously prevalent at least two different binomials for each of a large group of American plants; of these names the botanical writer is free to take his choice. An author's name appended to the binomial always makes it clear, however, so that the condition of affairs here is not nearly so serious as is sometimes supposed. It may be hoped, nevertheless, that taxonomists may agree to employ but a single binomial for each recognized plant species sometime before the world adopts a universal language. Students of plants will

probably realize sooner or later that nomenclature is not in any true sense an end in itself, but is merely a more or less conventional tool for expressing important relations. Britton and Brown's work makes such a position easy, for these authors are careful to give synonyms wherever needed.

Numerous changes have been made from the first edition, some of them minor, some of them farther reaching. The whole number of species included has been increased from 4,162 to 4,666, and the number of recognized genera is now 1,229 instead of 1,103 as in the first edition. There now appear 194 families instead of 177. The genus "*Crataegus*" has grown remarkably during the last decade; the first edition of the "Flora" recognized but fifteen species while the present edition includes seventy-three.

The excellence of typography and of mechanical and æsthetic features, which characterized the earlier volumes, has been retained in the books before us. It is safe to predict that the new "Flora" will find a place on the shelves of every botanical library. B. E. LIVINGSTON.

The Coming Mexico. By Joseph King Goodrich. The World To-Day Series. xii and 280 pp. Ills., index. A. C. McClurg & Co., Chicago, 1913. $1.50. 7½ x 5.

The author has the advantage of having known Mexico since 1866. Scenery, prehistoric civilization, social and economic phenomena are considered as well as the country's resources and the prospects of their development. Such a wide field cannot of course be adequately covered within the space of a single volume. Nevertheless the work will be instructive to those who have never traveled south of the Rio Grande. Optimistic views regarding the Republic's future are presented. LEON DOMINIAN.

The Viceroy of New Spain. By Donald E. Smith. *Univ. of California Publications in History,* Vol. 1, 1913, No. 2, pp. 99-293. Berkeley, Cal. $2. 10 x 6½.

This publication is specifically historical. It is an honest, liberal and impartial effort, fair to Spanish matters and utterly free from the invective and vituperation commonly poured out upon them by writers of other nations. The sources at the command of the author are comparatively limited and he is conscious of it, but what he had he has used conscientiously and with unusual fairness. AD. F. BANDELIER.

Bermuda, Past and Present. A Descriptive and Historical Account of the Somers Islands. By Walter Brownell Hayward. xii and 239 pp. Ills., index. Dodd, Mead & Co., New York, 1912. $1.25. 8 x 5½.

From the tourist's point of view this is, on the whole, the most helpful book on Bermuda. It does not supplant such a work as Verrill's but it is handy to carry and its information has been carefully compiled. It includes an account of the history of Bermuda as well as an adequate description of the wonderful charm and comfort that of late years have drawn to this dotlet in the ocean from 15,000 to 27,000 visitors a year. Unfortunately some popular books sold to tourists as guide books, while containing much helpful information, are marred by many trivialities and inaccuracies.

Why a mere mention in Mr. Hayward's book of the "Boilers or Coral Atolls"? A good picture of them is given. They are peculiar to Bermuda, their process of development is well known and it would interest any intelligent person to be told something of the origin of this remarkable feature of the south coast.

CENTRAL AMERICA AND WEST INDIES

La Immigración Italiana y la Colonización en Cuba. Por F. F. Falco. 96 pp. Index. Soc. Tipogr.-Editrice Nazionale, Turin, 1912. 9½ x 6½.

While Dr. Falco's report deals mainly with Italian emigration to Cuba, its value as a contribution to the problem of Italian emigration entitles it to wider consideration. Ample evidence of the author's twenty years' investigation of

the subject is revealed by the thoroughness of his compilation. After reviewing the causes and different phases of this Italian movement the writer examines the various methods which might tend to create a current of immigration towards Italy. He evidently does not view with favor the activity displayed by steamship and railroad companies in fostering such movements. It must be acknowledged, nevertheless, that the incentive to increase passenger traffic by transportation companies has been of itself an exceedingly potent factor in the creation and growth of modern emigration currents. LEON DOMINIAN.

The Story of Panama: The New Route to India. By Frank A. Gause and Charles Carl Carr. xii and 290 pp. Map, ills., index. Silver, Burdett & Co., New York, 1912. $1.50. 8½ x 6.

The Panama Canal. By Duncan E. McKinlay. 40 pp. Ills. Whitaker & Ray-Wiggin Co., San Francisco, 1912. 75 cents. 8½ x 6.

The Panama Canal. Pictorial View of the World's Greatest Engineering Feat, Linking the Atlantic and Pacific Oceans. With a Brief History and Description of the Gigantic Undertaking. By Thomas H. Russell. 25 pp. Ills. Hamming Publishing Co., Chicago, 1913. 60 cents. 6 x 8.

The completion of the Panama Canal provides the occasion for books with variety of appeal according as the probable interest of one class of reader may vary from that of another class and according as one aspect or the other of the great work has attracted the writer. Here we group three works of different types, necessarily somewhat overlapping.

The little volume by Dr. Russell is pictorial, almost panoramic in the selection of illustrations which may carry the reader from Colon over the Culebra height to Panama. The few pages of text are designed to be no more than introduction and brief commentary upon the work shown in the pictures.

Congressman McKinlay saw at the Isthmus those aspects of the canal which had been the subject of debate in the Capitol and at the Executive Departments. His record deals with legislation, with treaty rights, with canal type and above all with the condition of law which it was necessary for the Canal Commission to establish.

The work of Gause and Carr is more ambitious in tone. It aims to present a standard history of the canal from its inception to its completion. Ancillary thereto they have dealt with the history of the Isthmus from Balboa to the Republic of Panama. WILLIAM CHURCHILL.

SOUTH AMERICA

Aborigines of South America. By the late Colonel George Earl Church. Edited by Clements R. Markham. xxiv and 314 pp. Map, index. Chapman & Hall, Ltd., London, 1912. 10s. 6d. 9 x 6.

The present work could have no better review than that contained in the preface by the editor, Sir Clements R. Markham, himself an eminent authority on the geography and tribal settlements of South America. In it he speaks with appreciation of the extent of Col. Church's knowledge of his subject and of the value of his observations and deductions, lamenting the untimely death which left the volume unfinished.

In the introduction the author briefly sketches the early physical features of South America and their relation to the aborigines, showing that vast inland seas first divided the continent into two great divisions, the Brazilian and Andean, and then by their gradual desiccation left stretches of forest and an intricate network of waterways which became the inaccessible refuge and home of savage tribes. From what source these earliest races came Col. Church does not even conjecture, but contents himself with saying that the habitable areas were probably well populated at a period coeval with the Pliocene and mammalia of which remains are found in great abundance in southeastern Bolivia, the Argentine, and Brazil. He then discusses the trend of migration and the habits and customs of the aborigines, but admits the diffi-

culty of obtaining data because of the conditions to which they have been forced to submit since the conquest.

Chapters I and II deal with the Caraios and the Tapuyas, the tradition being that the latter were the earlier race who had once held the Atlantic Coast line from the Rio de la Plata to the Amazon, and who were conquered and partly dispossessed by the invading Caraios. These two races still differ widely in respect of physique, habits, ceremonies, language and stage of civilization, the Tapuyas being pure nomads and the Caraios showing a high degree of agricultural skill and some well organized tribal cohesion.

The remainder of the volume is devoted to a brief but clear emuneration of the other races which came under Col. Church's observation. Omitting minor tribes they are the peoples of Southwestern Amazonia, of Lowland Amazonia and of the eastern slope of the Andes; and the Chiriguanos and the Abipones.

Barring the somewhat categorical effect which is imposed by the nature of the subject matter, the style is charming and the book full of personal touches which easily explain the friendly relations Col. Church was able to establish with these half-savage tribes. ELLEN S. OGDEN.

AFRICA

Periplo dell'Africa. Del Capitano E. A. d'Albertis. vii and 572 pp. Maps, ills., index. Fratelli Treves, Milan, 1910. 10 x 6½.

The sixteenth travel book which Captain d'Albertis has written. His works are in the best class of popular travel narratives. He is always the keen observer, eagerly seeking facts and accurately and entertainingly recording them. His latest journey included the circumnavigation of Africa with an ascent of the Nile (Cairo-Khartum, describing also an earlier journey, Khartum-Port Sudan), a cross-country trip (Beira-Rhodesia-Transvaal-Cape Town), many ports in east Africa and St. Helena and the Canary Islands on the homeward journey. The whole book is profitable reading, and some of the chapters, as those on Rhodesia, the Transvaal and the Cape of Good Hope, are especially informing. The 540 photographs add largely to the value of the work.

Les Nègres d'Afrique (Géographie Humaine). Par Cyr. Van Overbergh. Collection de monographies éthnographiques. xii and 276 pp. Albert Dewit, Brussels, 1913. 10 x 7.

This volume contains the introductory chapters written for each of ten monographs now before the public which treat of ten great African tribes, the Bangala, Mayombe, Basonge, Mangbetu, Warega, Kuku, Ababua, Mandja, Baholoholo and Baluba, all living in the Belgian Congo excepting the Kuku (Anglo-Egyptian Sudan) and the Mandja (French Equatorial Africa). These studies were made on a uniform plan approved by the International Congress at Mons in 1905 and based upon 202 sub-topics arranged for systematic treatment. The monographs were written by Mr. Cyr. Van Overbergh, President of the International Bureau of Ethnology, assisted by workers in the various fields. The introductory chapters giving a general summing up of the environment and the characteristics of each tribe are full of condensed information. The price per volume is 10 francs; and to subscribers to the entire collection, 7.50 francs. Other volumes are in press.

GENERAL

La Côte d'Ivoire Chrétienne. Par R. P. J. Gorju. iv and 219 pp. Map. ills. Soc. Missions Africaines de Lyon, 1912. Fr. 4. 10 x 6½.

This book is written by a member of the missionary staff of the Ivory Coast and it is to a large degree a history of the mission from the time of its establishment in 1895. A single chapter is devoted to the country and its inhabitants, and although it is brief the main points of the physiography of the country are clearly outlined and a few of the customs of the natives, especially such as would seem reprehensible, are mentioned. The greater part of the book is a recital of arrivals and departures of missionaries, the founding

of new mission stations and the various problems of the work. Enough of the contact with the people and the struggle with the unusual conditions is written into the history to yield a knowledge of the geography of the country. The fight with yellow fever was severe, and nearly every chapter chronicles the death of a member of the devoted band. In reality the book is a memorial to the large number of missionaries who in a brief period lost their lives in this inhospitable land. ROBERT M. BROWN.

ASIA

Über die geographische Verbreitung und die Formen der Altertümer in der Nordwestmongolei. Von J. G. Granö. 55 pp. Reprint, *Journ. Soc. Finno-Ougrienne,* Vol. 28. Helsingfors, 1910. Fmk. 2.

The author has recognized that for a region so well explored as this border land of Mongolia at the meeting of forest and desert the mere listing of archæological finds has little value. He prefers to discuss such material under the topics of site, such as grave mounds, and graves marked on the surface by parallelogrammatic stone enclosures, such as stone wallings and pillars. To these considerations of site he adds notes upon graphic art and inscriptions. Then in wider survey he traces the geographical extent of the several types of remains and differentiates therein the nomadic peoples whose support is in their herds and the agricultural people for whom fixity of habitation is beginning.

Die Provinz Yünnan, ihre Handels- und Verkehrsverhältnisse. Von F. Weiss. Reprint, *Mitt. Seminars für Orient. Sprachen zu Berlin,* Vol. 15, Abt. 1: Ostasiatische Studien. 1912.

This most western province of China proper, almost unknown twelve years ago, has been coming into light through the French railroad to the city of Yunnan, the French and British railroad surveys with incidental studies of population and resources and the work of several other explorers. This book is a good summary of the information collected by some though not all of the sources upon which our knowledge now depends, including the annual and decennial reports of the Chinese Customs Service. The material is logically arranged, compactly treated and is for the present the most complete and convenient source of reference as to the geography, population, resources, industries, communications and commerce of Yunnan.

Chinesische Geschichte. Von Dr. Heinrich Hermann. 519 pp. Index. D. Gundert, Stuttgart, 1912. Mk. 10. 10 x 6½.

There are rich possibilities in the promise of modesty when the student prefaces his work with the simple statement "I am no historian, but an acquaintance with Chinese history struck me as essential to my duty in a mission high school." Historians of China there have been none. Histories of China have been many. The difficulty has lain in the fact that to comprehend the logical sequence in the chronological sequence of events of enormous ages in the Middle Kingdom it is necessary to have familiarity with the working of the Chinese mind in a psychology whose postulates are alien to our thought. The willow pattern plate exhibits in its single disk the whole difference between Orient and Occident. To Chinese taste that design tells clearly and perfectly a simple and pleasing tale; to us the story is almost undecipherable because it lacks the particular quality of perspective which we have learned to expect and which we, quite forgetting that its acquisition is a matter of but the most recent centuries of our art life, have come to regard as an immutable datum of nature. Thus we find in our libraries many histories of China and not a single history. The critic may not venture to contravene the modest preface of Dr. Hermann. We may not assert against his denial that this Chinese history is really a History of China. But it comes very close to that success. It is well balanced in all its parts, its narrative is clear and comprehensible, its philosophy is brilliantly explicative in exhibiting to our untrained minds the logic of Chinese thought in the causation of successive and dependent events. Our at-

titude toward this culture persisting in steady and consistent growth from the antiquity of human society is tiresome even to ourselves, to the Chinese literati it is childish. How old is our logic? St. Thomas Aquinas was contemporary with Kublai Khan, and China had prospered for nineteen whole dynasties before that time. When our new learning acquired the gift of inductive logic the Ming dynasty had run half its span. China has many treatises of its own on Chinese history. The only difficulty has been that we either cannot or will not comprehend it. I regard this work as far in advance of former Caucasian histories of China in the particular that it is rich in the interpretation of Chinese history in terms of our thought and therefore is comprehensible.

WILLIAM CHURCHILL.

Men and Manners of Modern China. By J. Macgowan. 351 pp. Ills., index. Dodd, Mead & Co., New York, 1912. $3.50. 9 x 6.

This is one of the volumes which the political change in the Middle Kingdom has suggested, by no means the least considerable of a rapidly growing library of sinology. All but a few of its chapters have found publication as historical essays in the *North China Herald* and have already been published in China in a collected volume. This more definite presentation is a new and enlarged edition of a work which took its true form at a period preceding the recent discharge of the Manchu from imperial rule, while the revision has afforded opportunity for the inclusion of recent events.

Mr. Macgowan has been devoted to Chinese affairs for a half century. In eastern Asia he has long been commonly bracketed with Sir Robert Hart for intimate familiarity with the Chinese character. We may therefore accept his conclusions with full confidence and thus find in them a safe approach to the comprehension of a social complex which is in general quite as difficult of study as it is worthy of understanding. Upon one point of particular application to this new China these interesting chapters will shed light, namely, the depth of the revolution. We may think that a desire for freedom is instinct within the mass of the Chinese people and that an outraged race has arisen in its might to shake off the oppressor. This volume will make it clear that there is no such thing as a Chinese race capable of united action for the betterment of its own condition, that conditions vary from province to province or other governmental administrative unit, and that the revolution is so superficial that not in long years will the basic Chinese even know that it has taken place.

WILLIAM CHURCHILL.

A Summer Ride Through Western Tibet. By Jane E. Duncan. 316 pp. Ills., index. W. Collins, London, 1913 (?). 1s. 6 x 4.

The instructive story of a woman's journey along the upper Indus valley. A clear picture of the region is given and the customs and industries of the mountain population are described. The route extended from Srinagar to Leh and down the Indus to the Vale of Kashmir; but from the main route many side trips were taken so that the book is a reconnaisance of the mountain district north of the Sind valley in India. As the journey was taken leisurely, Miss Duncan has been able to picture some phases of Tibetan life which escape the more hurried traveler. A few good maps would add to the value of the book.

ROBERT M. BROWN.

GENERAL

Changes in Bodily Form of Descendants of Immigrants. (Final Report). Prepared by Franz Boas. xii and 573 pp. Reports of the Immigration Commission. 61st Congress, 2d Session, Senate Document No. 208. Washington, 1911. 9½ x 6.

This work at its first appearance attracted great attention among anthropologists. It is in that branch of science that the work may properly be discussed and an estimate be made of the validity of its conclusions. It suffices to say here that the author has been most diligent in accumulating data and ingenious in presenting the record in such manner as to facilitate study. The present edition, somewhat enlarged by additional detail, is printed as a Senate document at the request of the Immigration Commission.

Missionslose Länder. Ungelöste Missionsaufgaben. Von D. S. M. Zwemer. Berechtigte Übersetzung aus dem Englischen von Luise Öhler mit einem Vorwort vom D. Jul. Richter. Handbücher zur Missionskunde, 5. Band. 227 pp. Maps, ills. Basler Missionsbuchhandl., Basel, 1912. 60 cents. 7½ x 5.

One of the results of the world's missionary conference held in Edinburgh in 1910 has been the compilation of a series of mission texts in which are summed up the results hitherto scattered through a vast file of sectarian journals. The purpose of this library is to further the efficiency of mission work by the production of professional papers wherein the beginner may study the methods which have been found most effective by his predecessors in the field. Of the German series Handbücher zur Missionskunde, this forms the fifth volume. Dr. Samuel Zwemer is well known for his evangelical work among the Mohammedans. This volume points out the new fields for missionary endeavor. From the figures which he presents it is seen that the mission field must long remain a large one, for Christianity has spread in name, even if no more, to but one-third of the population of the earth.

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later

NORTH AMERICA

COLOR KEY TO NORTH AMERICAN BIRDS. By Frank M. Chapman. With upward of 800 drawings by C. A. Reed. Revised edition. x and 356 pp. Bibliogr., index. D. Appleton & Co., New York, 1912. $2.50. 9 x 6. [A standard work of reference for easy identification of birds.]

FRUIT-FARMING ON THE "DRY BELT" OF BRITISH COLUMBIA. The Why and Wherefore. By J. S. Redmayne. 132 pp. Map, ills. The Times Book Club, London, 1912. 2s 6d. 11 x 9.

(*a*) LAND, FISHERIES AND GAME, MINERALS. 1911. 519 pp. Maps, ills., index. (*b*) Long Sault Rapids, St. Lawrence River. An Enquiry into the Constitutional and Other Aspects of the Project to Develop Power Therefrom. By Arthur V. White. 384 pp. Maps, ills., index. 1913. (*c*) Fur-Farming in Canada. By J. Walter Jones. viii and 166 pp. Maps, ills., index. 1913. (*d*) Sea-Fisheries of Eastern Canada. Proceedings of the Committee on Fisheries, Game and Fur-Bearing Animals of the Commission of Conservation, Ottawa, June 4-5, 1912. 212 pp. Ills., index. Commission of Conservation, Canada. Ottawa. 10 x 7 each. [Admirably compiled reports helpful to those engaged in the development of resources and industries.]

SECOND ANNUAL REPORT [OF THE COMMISSION OF CONSERVATION, CANADA] Including a Report of the Proceedings of the Second Annual Meeting, Quebec, Jan. 17-20, 1911, and of the Dominion Public Health Conference, Ottawa, Oct. 12-13, 1910. vii and 230 pp. Index. Report of 3d Annual Meeting, Ottawa, Jan. 16, 1912. vi and 154 pp. Maps, ills., index. Report of 4th Annual Meeting, Ottawa, Jan. 21-22, 1913. 238 pp. Maps, ills., index. Commission of Conservation, Canada, Ottawa. 10 x 7 each. [A wide range of economic data on Canada's natural resources.]

WATER-POWERS OF CANADA. By Leo G. Denis and Arthur V. White. 397 pp. Maps, ills., index, and maps in separate case. Commission of Conservation, Canada. Ottawa, 1911. [A thorough treatment of the subject.]

THE HEART OF GASPÉ. Sketches in the Gulf of St. Lawrence. By John Mason Clarke. xiv and 292 pp. Map, ills. The Macmillan Co., New York, 1913. $2. 8 x 5½. [A charming and informing book by the State Geologist of New York.]

AFRICA

TAGEBUCHBLÄTTER AUS NORDAFRIKA. Von Anna Tittmann-Sulzberger. 116 pp. Schulthess & Co., Zürich, 1912. Mk. 1.80. 7½ x 5.

AU COEUR DU MAROC. Par Louis Botte. 2nd ed. Collection des Voyages Illustrés. 227 pp. Map, ills. Hachette et Cie, Paris, 1913. Fr. 4. 7½ x 5.

LA SOCIÉTÉ MAROCAINE. Études Sociales, Impressions et Souvenirs. Par Dr. Mauran. Avec une lettre-préface de M. Le Général d'Amade. 299 pp. Ills. Henry Paulin et Cie, Paris, 1912 (?). Fr. 5. 10 x 6½. [Observations on customs and mode of life.]

DANS NOTRE EMPIRE NOIR. Par Maurice Rondet-Saint. vii and 237 pp. Map. Plon-Nourrit et Cie, Paris, 1912. 7½ x 4½. [A narrative of personal experiences.]

DER KONGOSTAAT LEOPOLDS II. Von Max Büchler. 1. Teil. Schilderung seiner Entstehung und seiner wirtschaftlichen Verhältnisse. viii and 235 pp. Rascher & Cie, Zürich & Leipzig, 1912. 8½ x 5½. [Deals with the beginnings of the colony and tells how the late King Leopold became interested in Central Africa.]

SUL D'ANGOLA. Relatorio de um governo de distrito (1908-1910). By João de Almeida. xix and 606 pp. Maps, ills. Ministry of Colonies, Lisbon, 1912. [Physiographical, ethnographical and historical notes precede the account of Portuguese occupation and administration.]

ASIA

PAYSAGES D'ASIE. Sibérie-Chine-Ceylan. Par Henry Asselin. 2nd ed. 234 pp. Hachette et Cie, Paris, 1911. Fr. 3.50. 7½ x 5.

IL MILIONE. Secondo il Testo della "Crusca." Reintegrato con gli altri Codici Italiani. Di Marco Polo. A cura di Dante Olvieri. 317 pp. G. Laterza & Figli. Bari. 1913. L. 5.50. 8½ x 5½. [Based on a collation of the "ottimo" edition of Marco Polo with Tuscan and Venetian versions instead of the original French.]

THE CALL OF THE SNOWY HISPAR. By Fanny Bullock Workman and William Hunter Workman. Map, ills. 1913. 9½ x 6½. [A fine set of photogravures accompanied by short descriptive notes. The large number of views portray the elevated region in much detail.]

MES TROIS ANS D'ANNAM. Par Gabrielle M. Vassal. Préface de M. le Dr. Roux. viii and 303 pp. Map, ills. Hachette et Cie, Paris, 1912. 7½ x 5. [Much information on the customs of the Moi tribes.]

EUROPE

ROYAL CASTLES OF ENGLAND. Comprising an account of those ancient fortresses which from the days of William the Conqueror either were the homes of English sovereigns or have been intimately associated with the history and romance of their lives. By Henry C. Shelley. xii and 349 pp. Ills., index. L. C. Page & Co., Boston, 1913. $3. 8½ x 6.

THE GOVERNMENT OF ENGLAND. By A. Lawrence Lowell. New edition, with additional chapter. Vol. 1: xvii and 584 pp. Vol. 2: viii and 563 pp. Index. The Macmillan Co., New York, 1912. $4. 2 vols. 9 x 6½ each. [Instructive historical records and political discussions.]

DAS RUSSISCHE REICH IN EUROPA UND ASIEN. Ein Handbuch über seine wirtschaftlichen Verhältnisse. Herausgegeben von A. von Boustedt und D. Trietsch. 2nd ed. 508 pp. Börsen & Finanzliteratur, Berlin, 1913. Mk. 8. 9½ x 8. [Excellent handbook of commercial and economic information.]

DIE NIEDERELBE. Von Richard Linde. Land und Leute, Monographien zur Erdkunde, No. 28. 202 pp. Map, ills., index. Velhagen & Klasing, Bielefeld & Leipzig, 1913. Mk. 4. 10 x 7. [One of the excellent regional descriptions which these publishers issue. Splendidly illustrated.]

VOYAGE DU CARDINAL D'ARAGON EN ALLEMAGNE, HOLLANDE, BELGIQUE, FRANCE ET ITALIE (1517-1518). Par Don Antonio de Beatis. Traduit de l'Italien d'après un manuscript du seizième siècle. Avec une introduction et des notes par Madeleine Harvard de la Montagne. Préface de Henry Cochin. xxx and 327 pp. Ills., index. Perrin et Cie, Paris, 1913. Fr. 5. 8 x 5½. [Scenes and customs sketched by an alert observer. They afford an excellent picture of conditions prevailing at the time. Explanatory notes accompany the text.]

WAS MAN FÜR EINE SCHWEIZER-REISE WISSEN MUSS. Anhaltspunkte für Reiselust und Kulturinteressen. Von Josefine Mann. 139 pp. Ills., index. O. Füssli, Zürich, 1913. 7 x 5. [Practical suggestions and information for the tourist.]

THE SCENERY OF SWITZERLAND AND THE CAUSES TO WHICH IT IS DUE. By The Right Hon. Lord Avebury. 4th ed. xxxv and 489 pp. Maps, ills., index. Macmillan & Co., London, 1906. $1.50. 8 x 5½. [A new edition of this standard work.]

THE MAKING OF THE BALKAN STATES. By William Smith Murray. 199 pp. Map. *Studies in History, Economics and Public Law*, Vol. 39, No. 1. Columbia University, New York, 1910. $1.50. 10 x 6½. [Review of events that led to political disturbances in the Balkans. Considerable light thrown on the causes of recent boundary modifications.]

LA VIVANTE ROUMANIE. Par Paul Labbé. Collection des Voyages Illustrés. 202 pp. Map, ills. Hachette et Cie, Paris, 1913. Fr. 4. 7½ x 5. [The latest of the excellent popular works of this well-known traveler.]

MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY

MILITARY TOPOGRAPHY FOR THE MOBILE FORCES, INCLUDING MAP READING, SURVEYING AND SKETCHING. By Captain C. O. Sherrill. 3d ed. xviii and 353 pp. Maps, diagrams, index. U. S. Cavalry Association, Ft. Leavenworth, Kansas. $2.50. 9 x 5½.

PHYSICAL GEOGRAPHY

FESTLÄNDER UND MEERE IM WECHSEL DER ZEITEN. Von Wilhelm Bölsche. 103 pp. Maps, ills., index. Franckh'sche Verlagshandlung, Stuttgart, 1913. Mk. 1. 8 x 5½. [The evolution of continental land-masses simply described.]

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JENSEITS DER HOCHKULTUR. Ein Beitrag zur Wertschätzung der Menscheit. Von A. Sokolowsky. 84 pp. Ills. Deutsche Verlagsgesellschaft, Hamburg, 1912. Mk. 3. 9 x 6. [Essays on the development of culture under varied surroundings.]

METHODOLOGY AND TEACHING

PHILIPS' GEO-GRAPH BOOK. A Geographical Observation Note Book for Climatic, Astronomical and Other Records. By J. H. Hack. Part 1. 32 pp. G. Philip & Son, Ltd., London, 1913. 3d. 10 x 8. [A set of blank diagrams and charts for filling out.]

DEDUCTIVE EXERCISES IN GEOGRAPHY: Europe. By Cyril R. Dudley. 62 pp. Maps. George Philip & Son, Ltd., London, 1913. 1s. 8½ x 6½.

GENERAL

COMMON SENSE IN FOREIGN POLICY. By Sir Harry Johnston. x and 119 pp. Maps. Smith, Elder & Co., London, 1913. 2s 6d. 9 x 5½. [The relations between Great Britain and foreign countries are discussed, including the commercial factors involved. Text and maps set forth the author's views on the future orientation of world-politics.]

ROBERT FULTON, ENGINEER AND ARTIST. HIS LIFE AND WORKS. By H. W. Dickinson. xiv and 333 pp. Ills., index. John Lane Co., New York, 1913. $3. 9 x 6. [Based on documentary evidence sought in England, France and the United States. The story of the introduction of steam navigation in the Western Hemisphere.]

L'AVIATION. Par Paul Painlevé, Émile Borel, Ch. Maurain. Nouvelle collection scientifique. 6th ed. viii and 298 pp. Ills. Félix Alcan, Paris, 1913. Fr. 3.50. 7½ x 5.

THE FEDERAL SYSTEMS OF THE UNITED STATES AND THE BRITISH EMPIRE, Their Origin, Nature and Development. By Arthur P. Poley. viii and 453 pp. Index. Pitman & Sons, Ltd., London, 1913. Little, Brown & Co., New York. 12s 6d. 8½ x 5½.

TEXT-BOOK OF ZOOLOGY. By H. G. Wells and A. M. Davies. 6th ed. Revised by J. T. Cunningham. viii and 487 pp. Ills., index. University Tutorial Press, London, 1913. 6s 6d. 7 x 5.

LIFE AND ADVENTURES OF AUDUBON, THE NATURALIST. By Robert Buchanan. Series: Everyman's Library. xx and 335 pp. Index. E. P. Dutton & Co., New York, 1913 (?). 35 cents. 7 x 4½. [An excellent biography of the noted American ornithologist.]

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—— Lower Devonian. 560 pp. Maps, ills., index. Middle and Upper Devonian. 720 pp. Maps, ills., index. Vol. of plates, 156 pp. [Form part of a series of reports dealing with the systematic geology and paleontology of Maryland.] Maryland Geological Survey, Baltimore, 1913.

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Alaska. Western Part [of] Prince William Sound, South Coast [of] Alaska. 1:80,000. 60°53′ - 60°21′ N.; 148°16′ - 146°5′ W. 1 color. Chart No. 8517. May 1913. Price 50 cents.

Maryland. (a) Chesapeake Bay: Sandy Point to Head of Bay. 1:80,000. 39°36.5′ - 39°0.9′ N.; 76°39.6′ - 75°47.0′ W. Chart No. 1226. June 1913. 50 cts.

(b) Chesapeake Bay: Cove Point to Sandy Point. 1:80,000. 39°2′ - 38°22′ N.; 76°35′ - 75°48′ W. 1 color. Chart No. 1225. June 1913. 50 cts.

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Maryland-Virginia. Chesapeake Bay: Smith Point to Cove Point. 1:80,000. 38°24′ - 37°52′ N.; 76°29′ - 75°34′ W. 1 color. Chart No. 1224. July 1913. 50 cts.

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New York-New Jersey. Kill Van Kull. 1:15,000. 40°39.6′ - 40°36.9′ N.; 74°12.2′ - 74°3.8′ W. 1 color. Chart No. 544. 30 cts.

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* Only new charts are listed, not new editions of old charts.

North Carolina. (a) Albemarle Sound. 1:80,000. 36°23′-35°50′ N.; 76°47′-75°52′ W. 1 color. With inset: Continuation of Alligator River. 1:80,000. 35°50.5′-35°37.8′ N.; 76°8.2′-75°58.5′ W. 1 color. Chart No. 1228. May 1913. 50 cts.

(b) Currituck Beach to New Inlet. 1:80,000. 36°23.0′-35°33.5′ N.; 75°59′-75°17′ W. 1 color. Chart No. 1229. June 1913. 50 cts.

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[Chart No. 6154 covers the same territory as old Chart No. 6145 and part of No. 6144; Chart No. 6152 covers the same territory as old Chart No. 6142 and part of No. 6141.]

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CENTRAL AMERICA AND WEST INDIES

Central America. Einige Vulkangebiete Zentralamerikas. Entworfen von Dr. Karl Sapper.

(a) [Six detailed maps, 1:100,000:] 1a. Vulkänchen westlich vom Güija-See in ihrer ungefähren Lage nach den unkorrigierten Itinerarlinien, 1895 und 1897. 1b (1a and 1b together form one map). Die Vulkänchen der Ebene von Jutiapa nach Itineraraufnahmen, 1892 und 1897. [14°40′-14°15′ N.; 90°10′-89°40′ W.]. 3 colors. 2. Die Lage der freien Lavaströme von El Tambor und Antobran. Itineraraufnahmen, 1889. [15°5′ N. and 89°45′ W.]. 1 color. 3. Die Lage des freien Lavastroms El Florido (Guatemala). Itineraraufnahmen, 1889 u. 92. [15° N. and 90¼° W.]. 1 color. 4. Ungefähre Lage der Vulkänchen östlich vom Ayarza See. Itineraraufnahmen 1892 u. 1897. [14⅓° N. and 90°5′ W.]. 3 colors. 5. Umgebung des Chingo und Viboras. Itineraraufnahmen, 1892 und 1897. [14°5′ N. and 89°45′ W.]. 3 colors. 6. Skizze der Umgebung von Cuajiniquilapa. Itineraraufnahmen, 1892 und 1897. [14°15′ N. and 90°15′ W.]. 3 colors.

(b) Übersicht. 1:7,500,000. 17°-7° N.; 94°-77° W. 3 colors.

Accompany "Die mittelamerikanischen Vulkane" by K. Sapper, *Ergänzungsheft zu Petermanns Mitt. Nr. 178*, 1913.

[Maps under (a) maps of minor groups of volcanoes, in southeastern Guatemala and northwestern Salvador. Map (b) an extract from sheets 92 and 93

of Stieler's Atlas showing the location of the detailed maps. On it maps 5 and 6 have inadvertently been transposed. The lack, in so authoritative a treatise, of a large-scale general map showing the relationship of the various groups of volcanoes to each other is disappointing.]

AFRICA

Eritrea. [Four maps, by M. Checchi, G. Giardi and A. Mori, on the scale of 1:1,500,000, bounded by 18°17' - 12°0' N. and 35°40' - 43°27' E., entitled:] (1) Carta della Zone Climatiche e delle Piogge nella Colonia Eritrea. Anno 1912. 8 colors. (2) Densità della Popolazione nella Colonia Eritrea. Anno 1912. 12 colors. (3) Distribuzione della Ricchezza in Bestiame nelle varie Regioni della Colonia Eritrea. Anno 1912. (4) Distribuzione del Bestiame nelle varie Regioni della Colonia Eritrea. Anno 1912. Accompany *Rivista Coloniale,* Vol. 8, 1913, Part I, No. 5, and Part II, Nos. 2, 3 and 6, respectively, map (1) illustrating "Brevi Notizie sulle Zone Climatiche nella Colonia Eritrea" by G. Dainelli and O. Marinelli, Vol. 8, Part I, No. 5, pp. 157-161.

[Valuable maps on a relatively large scale representing various phases of the geography of Eritrea and, in some cases, of northern Abyssinia. Map (1) distinguishes five climatic zones, based mainly on altitude and seasonal distribution of rainfall. Eight rainfall densities are shown; also mean annual temperatures of certain places. Map (2) differentiates between degrees of density of native population and indicates, by means of six symbols, how many Europeans reside in the various towns. Maps (3) and (4) relate to domestic animals, the former representing their value per square kilometer and per inhabitant, the latter showing the number per square kilometer of cattle, camels, horses, and sheep. The maps, which are all official and were previously published by the Direzioni Centrale degli Affari Coloniali of the Ministero degli Affari Esteri—newly created into an independent department under the name of Ministero delle Colonie—are good examples of modern Italian enterprise in colonial geography.]

German East Africa. (a) Hans Meyer's Ostafrika-Expedition 1911: Übersichtskarte, mit Eintragung der Vegetations-formationen auf Grund der Engler'schen Vegetationskarte von Deutsch-Ostafrika, abgeändert nach eigenen Beobachtungen von Hans Meyer. 1:5,000,000. 0° - 12½° S.; 29° - 40⅔° E. 13 colors. With inset: Geologische Übersicht der Reiseroute im Zwischenseengebiet und bis Tabora von Dr. Schlossmacher. 1:5,000,000. 1° - 5° S.; 29° - 33⅓° E. 7 colors.

(b) Hans Meyer's Ostafrika-Expedition 1911, Blatt 1: Ihángiro und der Burigi-See. Nach den Routen u. Messtischaufnahmen von Oberleutnant Tiller und mit Benutzung der Skizzen und Beobachtungen von Prof. Dr. Hans Meyer und allen älteren Materials unter Leitung von P. Sprigade u. M. Moisel konstruiert u. gezeichnet von F. Schröder. 1:300,000. 1°18' - 2°22' S.; 31°5' - 32°0' E. 5 colors.

(c) Hans Meyer's Ostafrika-Expedition 1911, Blatt 2: Die Muwissi-Berge und das westliche Randgebirge von Ruanda und Urundi. Nach den Aufnahmen von Oberleutnant Tiller und mit Benutzung der Skizzen und Beobachtungen von Prof. Dr. Hans Meyer und allen älteren Materials unter Leitung von P. Sprigade u. M. Moisel konstruiert u. gezeichnet von W. Rux. 1:300,000. 2°30' - 3°36' S.; 29°3' - 30°0' E. 4 colors.

(d) Hans Meyer's Ostafrika-Expedition 1911, Blatt 3: Süd-Ussagara. Nach den Routen u. Messtischaufnahmen von Oberleutnant Tiller und mit Benutzung allen älteren Materials unter Leitung von P. Sprigade u. M. Moisel konstruiert u. gezeichnet von F. Schröder. 1:300,000. 6°20' - 7°30' S.; 36°0' - 37°0' E. 2 colors. With inset: Vegetations-Karte von Süd-Ussagara. Von Dr. R. Houy. 1:900,000. 6°20' - 7°30' S.; 36°16' - 37°0' E. 4 colors.

(e) Der Kihonde-See in Südost-Ruanda. 1:300,000. [20°3' S. and 30°50' E.]

(f) Karte der Vulkane Niragongo und Namlagira. Ausschnitt der Originalkarte von Oberleutn. Weiss (1:100,000) mit Eintragung einiger neueren Höhenzahlen nach den Aufnahmen der Deutsch-Belgischen Grenzkommission. 1°23' - 1°42' S.; 29°7' - 29°21' E.

Accompany, maps (a) to (d) as "Übersichtskarte" and Karten 1, 2, and 3, respectively, in pocket, maps (e) and (f) on pp. 25 and 29, respectively,

"Ergebnisse einer Reise durch das Zwischenseengebiet Ostafrikas, 1911" by H. Meyer, *Ergänzungsheft Nr. 6 der Mitt. aus den Deutschen Schutzgeb.*, 1913.

[Maps incorporating some of the results of Dr. Hans Meyer's expedition of 1911, mainly to the region lying between Lakes Victoria and Kivu. Map (a) is a general map showing Dr. Meyer's route to this region, which led by the British East Africa railroad from Mombasa to Port Florence, thence by boat on Lake Victoria to Bukoba; the return was effected by the German East African railroad from Tabora to Dar-es-salam. On this map, besides, the plant formations are shown in the region traversed. The symbol for Dr. Meyer's route is shown in so faint a red that it is almost illegible in the northwestern corner of German East Africa because of the superposition of red ruling to indicate a plant formation. The route in this region may be followed in the inset, however, where it is shown in black.

Maps (b), (c) and (d) are important large-scale maps which constitute original contributions of the expedition to the mapping of the regions concerned. Map (b) covers the region immediately to the west of the southwestern corner of Lake Victoria, map (c) the region lying to the northeast of the northern end of Lake Tanganyika, comprising parts of Ruanda and Urundi. On all three maps all previous information has been added, so that they represent our present state of knowledge with regard to these regions. Relief is shown in approximate contours in brown, the author's route in red.

Map (d) is a text map of a small lake discovered by the expedition lying just west of the Kagera River in 2° S. lat. Map (e) is also a text map showing some of the volcanoes belonging to the Virunga group which was the special field of exploration of the Duke of Mecklenburg's expedition (see also maps listed under "German and British East Africa-Belgian Congo" in *Bull.* Vol. 43, 1911, p. 956 and under "Uganda-Belgian Congo-German East Africa" in Vol. 45, 1913, p. 877).]

ASIA

Turkey in Asia. La Syrie en 1912: Carte Administrative (Chemins de fer. Routes carrossables. Pistes principales). [1:3,000,000]. [37⅔° - 31° N.; 34° - 38⅔° E. Accompanies, as Pl. IX on p. 445, "Notes sur la Syrie (2e Partie)" by De Torcy, *La Géogr.*, Vol. 27, 1913, No. 6, pp. 429-458.

[Shows railroads in operation and projected, roads suited to wheeled traffic, and principal routes. Cf. also map listed under same heading in the *Bull.*, Vol. 45, 1913, No. 9, p. 718.]

AUSTRALASIA AND OCEANIA

Bismarck Archipelago. Sprachenkarte von Neu-Mecklenburg u. den Nachbargebieten. Entworfen von Dr. Georg Friederici. 1910. 1:1,000,000. 1° - 5° S.; 149° - 155° E. 12 colors. Accompanies "Wissenschaftliche Ergebnisse einer amtlichen Forschungsreise nach dem Bismarck-Archipel im Jahre 1908, II: Beiträge zur Völker- und Sprachenkunde von Deutsch-Neuguinea" by G. Friederici, *Ergänzungsheft Nr. 5 der Mitt. aus den Deutschen Schutzgeb.*, 1912.

EUROPE

Germany. (Höhenschichtenkarte des Grossherzogtums Hessen, 1:25,000). [7 sheets, in 2 to 3 colors (the first number refers to the position of the sheet in the Hessian, the second to its position in the Prussian scheme, as explained in the comment below), viz:] (1) Hess. No. 15, Pr. No. 3166: Blatt Giessen. 1908. 50°36' - 50°30' N.; 8°40' - 8°50' E. (2) Hess. No. 22, Pr. No. 3223: Blatt Hungen. 1911. 50°30' - 50°24' N.; 8°50' [incorrectly given in the S. W. corner as 20°30' E. of Ferro] - 8°60' E. (3) Hess. No. 39, Pr. No. 3407: Blatt Kastel. 2nd edition, revised, 1910. 50°6' - 50°0' N.; 8°10' - 8°20' E. Hess. No. 46, Pr. No. 3438: Blatt Mainz. 2nd edition, revised, 1910. 50°0' - 49°54' N.; 8°10' - 8°20' E. (5) Hess. No. 56, Pr. No. 3467: Blatt Darmstadt. 2nd edition, revised, 1910. 49°54' - 49°48' N.; 8°30' - 8°40' E. (6) [Hess. No. 72, Pr. No. 3505:] Blatt Lindenfels. 1893 - 98. 49°42' - 49°36' N.; 8°40' -

8°50′ E. (7) [Hess. No. 75, Pr. No. 3518:] Blatt Viernheim. 1899-1900. 49°36′ - 49°30′ N.; 8°30′ - 8°40′ E. Published by the Grossherzogl. Hessisches Katasteramt, and sold at M. 2. a sheet by the Grossherzogl. Staatsverlag, Darmstadt.

[Seven sheets of the topographical map of Hesse. It was begun in 1886 and is to comprise 80 sheets, of which about 66 have been published (see the index map listed under "Germany," second entry, in the *Bull.*, Vol. 44, 1912, p. 239). The limits of the sheets coincide, in principle, with those of the "Messtischblätter" on the same scale published by the Kgl. Preussische Landesaufnahme, with which sheets it bears great resemblance (for index map of the Prussian sheets see under "Germany," third entry, *loc. cit.*). Due to the lack of connection, at the beginning of the undertaking, between the Hessian and the Prussian triangulation systems, the earlier sheets of Upper Hesse do not coincide completely with the corresponding Prussian sheets. The discrepancy is indicated on the relevant sheets. In execution the sheets reflect the high standard maintained by the German government surveys: relief is in brown contours (interval 10 meters), drainage in blue, other features, including woods, in black. On map (4), which includes the southern part of the city of Mainz, proposed streets are shown in red.]

POLAR

Spitzbergen. (a) Übersichtskarte von Spitzbergen zur Veranschaulichung des Verlaufs der Expedition Schröder-Stranz und der Hilfsexpeditionen zu deren Rettung. Mercator's projection; scale in 80° N., 1:1,000,000. 80°50′ - 76°0′ N.; 9°10′ - 30°20′ E. 4 colors.

(b) Routenkarte der Hilfsexpedition des deutschen Observatoriums am Ebeltofts-Hafen zur Rettung der Mitglieder der Schröder-Stranz-Expedition, Mai 1913. Entworfen von Dr. Kurt Wegener. 1:250,000. 80°5′ - 78°43′ N.; 11°0′ - 17°30′ E. 4 colors.

Accompany, as Taf. 29 and 28, respectively, "Die Deutsche wissenschaftliche Station auf Spitzbergen und die Schröder-Stranz-Expedition" by H. Hergesell and K. Wegener, *Petermanns Mitt.*, Vol. 59, II, 1913, Sept., pp. 137-140.

[Map (a) a general large-scale map showing in red the routes of the various relief expeditions. Aside from its immediate purpose the fact that this map embodies all previous knowledge of the topography of the interior of Spitzbergen makes it valuable as a general reference map. Map (b) is a large-scale detailed map of West Spitzbergen between Ice Fiord and Wijde Bay, embodying new surveys in the interior made by Dr. Wegener on the relief expedition which he conducted. The route lay from King's Bay over the inland ice to the head of Wood Bay, then around the peninsula of Andree Land to West Fiord on the west shore of the upper end of Wijde Bay, and thence west back across the inland ice to King's Bay. On both maps relief is in brown, drainage and glaciers are in blue.]

WORLD AND LARGER PARTS

East Indies and Australasia. Übersichts-Skizze Indonesisch-Melanesischer Wanderzüge, von Dr. G. Friederici. 1:15,000,000. 12½° N. - 30° S.; 114° - 170° E. 5 colors. Accompanies "Wissenschaftliche Ergebnisse einer amtlichen Forschungsreise nach dem Bismarck - Archipel im Jahre 1908, III: Untersuchungen über eine melanesische Wanderstrasse" by G. Friederici, *Ergänzungsheft Nr. 7 der Mitt. aus den Deutschen Schutzgeb.*, 1913.

[Shows probable routes of migration of races which at present inhabit certain parts of Melanesia. Two routes are shown: (1) that of the Alfuro migration, from Ceram and the southern Moluccas along the north coast of New Guinea to Astrolabe Bay (146° E.), whence three branches diverge, one to the north coast of Neu Pommern (New Britain) and to Neu Mecklenburg (New Ireland), the second around the southeastern peninsula of New Guinea nearly to the Gulf of Papua, and the third via the Solomon Islands to the New Hebrides; (2) that of the Philippine or sub-Philippine migration, from

Palawan and the northeastern tip of Celebes along the north of New Guinea and the Bismarck Archipelago and skirting the outer side of the Solomon Islands to the New Hebrides. An extended review of the monograph which the map accompanies was published in the *Bull.*, Vol. 45, 1913, pp. 859-860.]

Other Maps Received

AFRICA

Morocco. Plano del Campo Exterior de Melilla y Croquis del Campo Fronterizo. 1:10,000. Depósito de la Guerra. [Madrid]. 1909.

Mapa de la Parte Norte de Marruecos. 1:500,000. 2 sheets. Depósito de la Guerra [Madrid].

Portuguese East Africa. Plano hydrographico do Rio Bons Signaes (Quelimane). 1:40,000. Commisão de Cartographia. Ministerio da Marina e Ultramar. [Lisbon]. 1910.

Portuguese West Africa. Plano Hydrographico da Bahia do Lobito. 1:10,000. Commisão de Cartographia, Ministerio da Marina e Ultramar. [Lisbon]. 1910.

ASIA

Burma. Burma, Rangoon Harbour. Sheet No. 1. 1:12,102. Deputy Conservator of the Port. [Rangoon, Burma.] 1912.

India. Carte de l'Inde Ecclésiastique. 1:4,400,000. Les Missions Catholiques. [Lyon].

The Motor Union Insurance Map of India. Sheets: North, and South. 1:2,027,520. G. W. Bacon & Co., Ltd., London, [1913].

Near East. [Map of the Near East]. 1:6,019,200 or 95.6 miles to 1 inch. With inset: Palestine. 1:685,000. G. W. Bacon & Co., Ltd., London, [1913].

EUROPE

Austria. Handkarte des Politischen Bezirkes Korneuburg. 1:150,000. G. Freytag & Berndt, Wien, 1913. 30 Heller.

Plan der k. k. Reichshaupt- und Residenzstadt Wien, herausgegeben unter Mitwirkung des Wiener Stadtbauamtes. Gezeichnet von Karl Loos. 1:25,000. R. Lechner (Wilh. Müller) k. u. k. Hof- u. Univ.-Buchhandlung, Wien, 1912.

Plan der k. k. Reichshaupt- und Residenzstadt Wien. Herausgegeben unter Mitwirkung des Stadtbauamtes. 1:20,000. Verlag von Gerlach & Wiedling, Wien. [1913].

Plan der k. k. Reichshaupt- u. Residenzstadt Wien. 1:30,000. Verfasst vom Stadtbauamte. 1901.

Plan der k. k. Reichshaupt- u. Residenzstadt Wien: Die Verteilungsanlagen der I. u. II. Kais. Franz Josef Hochquellenleitung. 1:50,000. [Stadtbauamt, Wien, 1910.]

[Region to the southwest of Vienna showing] Trasse der I. und II. Franz Josef-Hochquellenleitung. 1:200,000. k. u. k. Militärgeographisches Institut, [Wien].

Umgebung von Kastelruth, Seis, Salegg, Ratzes. 1:25,000. Verlag von Mich. Honeck, Seis.

Handkarte des Herzogtums Salzburg. Bearbeitet von Karl Adrian. 1:400,000. G. Freytag & Berndt, Wien, 1912. 24 Heller.

Touristenkarte der Sudeten. 1:100,000. Kommissionsverlag: Emil Wanke's Nachf., Josef Katzer, Mähr.-Schönberg. 50 Heller.

Schulhandkarte des Herzogtums Steiermark. Bearbeitet von Hans Trunk. 1:600,000. G. Freytag & Berndt, Wien. 30 Heller.

Austria-Hungary. Übersichtskarte der k. k. österreichischen Staatsbahnen und der im Staatsbetriebe befindlichen Privatbahnen nach dem Stande am 31. Dezember 1911. 1:1,300,000. With insets: Süd-Dalmatien; Nordwest-Böhmen, 1:750,000. [k. u. k. Militärgeographisches Institut, Wien, 1911.]

Central Europe. [Generalkarte von Mitteleuropa]. Sheets: 42°50° Lemberg, 43°50° Brody, 37° 44° Zvornik, 37° 43° Plevlje, 38° 43° Novipazar, 38°42° Prizren. 1:200,000. K. u. K. Militärgeographisches Institut, [Wien], 1912-1913.

Denmark. Stats–Telegraf– og Telefonkort. With inset: Kjöbenhavn. [Direction Générale des Postes, Ministère de l'Intérieur, Copenhague]. 1913.

Postkort over Danmark, Bilag til Post–Jernbane– og Telegrafhaandbogen. Scale about 1:700,000. With insets: Kjöbenhavn, Reykjavik, Hamburg, Rönne, Thorshavn. [Post Office Department, Copenhagen.]

Esbjerg. 1:8,300. J. Dalsgaard Olsens Forlag. Esbjerg. [1912].

Kort over Sønderjulland, med Navneliste. 1:320,000. Udvalget for Folkeoplysnings Fremme, 1912. 50 Øre.

Finland. Finlands Geologiska Undersökning (Suomenmaan Geologillinen Tutkimus). Sheets: Nos. 4, 1879; 7, 1882; 8, 1883; 9, 1884; 10, 1885;; 11, 1885; 12, Nystad, 1886; 13, Tavastehus, 1886; 14, Hangö, 1886; 16, Kumlinge, 1887; 17, Finström, 1888; 18, Tammela, 1889; 19, Hogland, 1888; 21, Mariehamn, 1890; 22, Walkeala, 1889; 23, Jurmo, 1891; 24, Mörskär, 1891; 25, Föglö, 1890; 26, Enskär, 1891; 27, Fredrikshamn, 1890; 28, Säkkijärvi, 1891; 29, Lavansaari, 1894; 30, Raivola, 1891; 32, Loimijoki, 1887; 33, Wiborg, 1892; 34, Muola, 1893; 35, St. Andreae, 1893; 36, Rautus, 1893; 37, Pyhäjärvi, 1893. 1:200,000. Finlands Geologiska Undersökning, Helsingfors.

France. Port de Boulogne-sur-Mer, Chambre de Commerce, No. 8. Plan du port et de la ville de Boulogne. [With French and English text]. 1:10,-000. With inset: Carte du Détroit. Chambre de Commerce, Boulogne, 1912.

Pyrénées Orientales. [1:170,000]. André Lesot, Paris.

Germany. Wegekarte des Egge-Gebirges, Herausgegeben vom Egge-Gebirgs-Verein. 1:50,000. C. Brockmann, Bielefeld.

Karte von Südhannover, herausgegeben von H. Deppe. 1:150,000. Verlag von Vandenhoeck und Ruprecht, Göttingen. 1 Mk.

Karte vom Schwarzwald. 1:400,000. Otto Weber, Verlag, Heilbronn, a. N. 50 Pfg.

Prof. W. Liebenow's Wander–, Rad– und Automobilkarte des Spessart, umfassend Unterfranken und Aschaffenburg. 1:300,000. Verlag von J. Franks Buchhandlung, Würzburg. 1.30 Mk.

Prof. W. Liebenow's Rad– und Automobilkarte der Eifel und des Hunsrück. 1:300,000. Verlag von Jacob Lintz, Trier. 2.50 Mk.

Prof. Liebenow's Automobil–, Rad– und Verkehrs-Karte von Niederhessen u. Waldeck mit Teilen vom Harz und Thüringer Wald. 1:300,000. A. Freyschmidt's Buchhandlung, Kassel. [1913]. 1.50 Mk.

Brieger's Wegekarte der Grafschaft Glatz. 1:100,000. With inset: Wegekarte vom Glatzer Schneegebirge, vom Bielengebirge und Wölfelsgrund. 1:75,-000. Verlag von Georg Brieger, Schweidnitz. 60 Pfg.

Wald-Karte von Oliva und dem Seebade Zoppot, für seine Besucher entworfen vom Verschönerungsverein zu Oliva. 1:25,000. Verlag von A. W. Kafemann, Danzig, 1912.

Neue Karte des Württ. Schwarzwaldvereins. Sheets: No. 1, Pforzheim, 1905; No. 2, Hohloh, 1902; No. 3, Wildbad-Calw, 1902; No. 4, Freudenstadt, 1901; No. 6, Alpirsbach-Schramberg, 1908; No. 7, Sulz-Oberndorf, 1911; No. 9, Rottweil-Spaichingen, 1913. 1:50,000. A. Bonz' Erben, Stuttgart. 2 Mk. each.

Neuester Plan von Graz. 1:14,400. Verlag von Paul Cieslar, Graz, 1895.

Sweden. Postkarta öfver Sverige. Two sheets. 1:800,000. With insets: Skäne, 1:600,000; Göteborgs och Bohus Län, 1:500,000.. [Post Office Department, Stockholm.]

Switzerland. Carte synoptique des principaux bassins fluviaux de la Suisse avec l'indication des stations limnimétriques et des stations météorologiques et pluviométriques. 1:500,000. Publiée par le Bureau hydrométrique fédéral à Berne, 1904.

Carte du Réseau Téléphonique Suisse. 1:250,000. Direction Générale des Télégraphes, Berne, 1912.

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BROADWAY AT 156TH STREET

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BULLETIN

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AMERICAN GEOGRAPHICAL SOCIETY

VOL. XLVI 1914 No. 2

RECENT EXPLORATION IN THE WESTERN SAHARA

By W. A. CANNON, Ph.D.

Desert Laboratory, Tucson, Arizona

Late accounts of travels in the Sahara remind us forcibly that this vast area, half as large as Europe, is, in large part, a veritable *terra incognita*. The traveler finds little of aid in the way of accurate or detailed maps, or descriptions of the topography, the animals or plants, or even of the manners of the various desert peoples which he will meet. The absence of these things, together with the inherent unfriendliness of the great desert, makes all travel across it an undertaking not to be held lightly. True on routes best known, it is especially true away from these routes, where often even the native tribes have never been, and where travel is exploration in fact.

The reason why the Sahara is as a whole so little known lies, as is well understood, in the fact that great obstacles are placed in the way of its exploration. These do not consist in the inhospitable climate only, but, among other things, in unfriendly tribes, fortunately growing fewer year by year, which are hardy peoples, living largely by preying on caravans. The leading factor which makes exploration of the desert at all possible is the camel, the "ship of the desert" in a very real sense, which can travel a week, or more, without water and food, making possible exploration where water can be obtained every 200 miles, more or less. But to-day even with the camel, and with guides, and with the protection afforded by the French, the trip across the Sahara, nearly 1,600 miles from Biskra to Timbuktu, is a *tour de force* requiring not alone much

physical endurance but the indefinable natural ability to meet and overcome whatever hindrances may fall in the path of a pioneer.

As a rule, caravans which cross the desert are for purposes quite

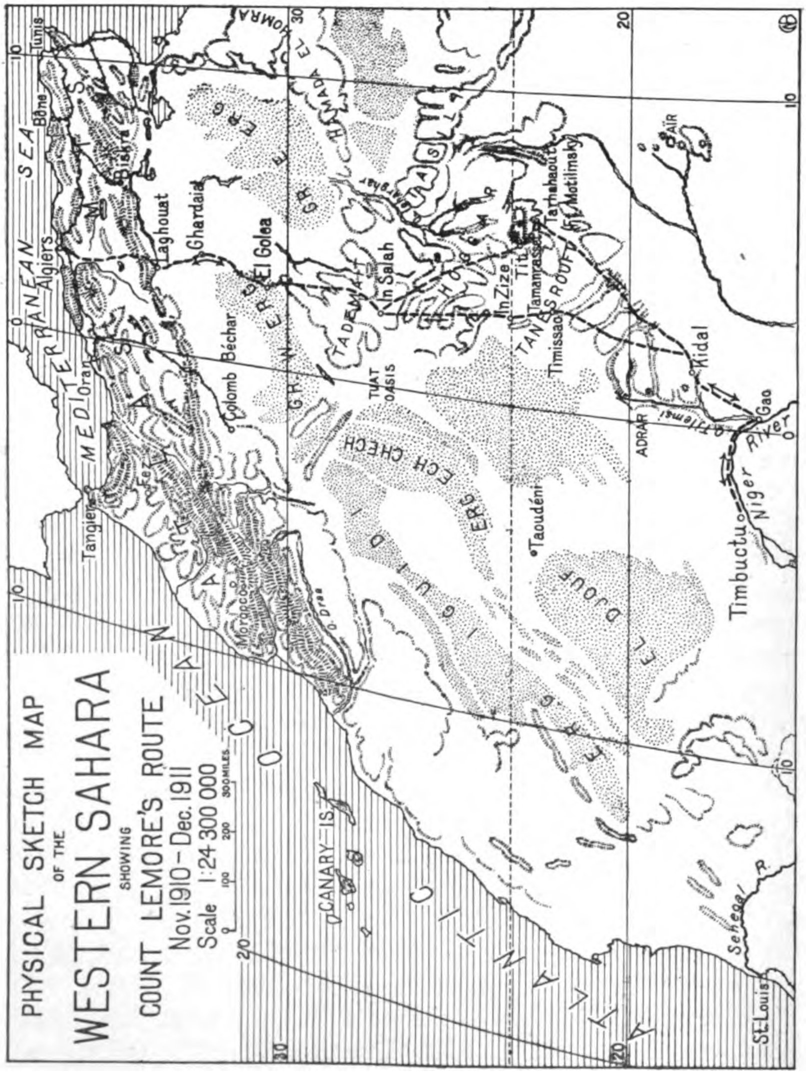

FIG. 1.
(N. B.—In the title, "Lemore" should read "Le More." On the map, for "Ft. Motilinsky" read "Ft. Motylinski.")

other than that of studying the country and its ways and such record as they may leave, of a consequence, do not give a satisfactory account of much we should like to know. Such observations as are given, however, when added to what has been done before,

are useful in gradually building up our knowledge of the great desert. Such a book is that by Count René Le More[1], a young Frenchman, who recently crossed the western Sahara twice, from Algiers to Timbuktu and return. On the way south Le More followed known paths, but on his return for a part of the route he covered territory previously untraveled. While largely a personal narrative, the book contains not a little that is of general interest and importance, especially to the French who will conquer the Sahara, if ever it is conquered, by the use of air craft. When the aeroplane branch of the French army, whose headquarters on the desert are at present at Biskra, is adequately developed, there appears to be no reason why the physiography and the natural history

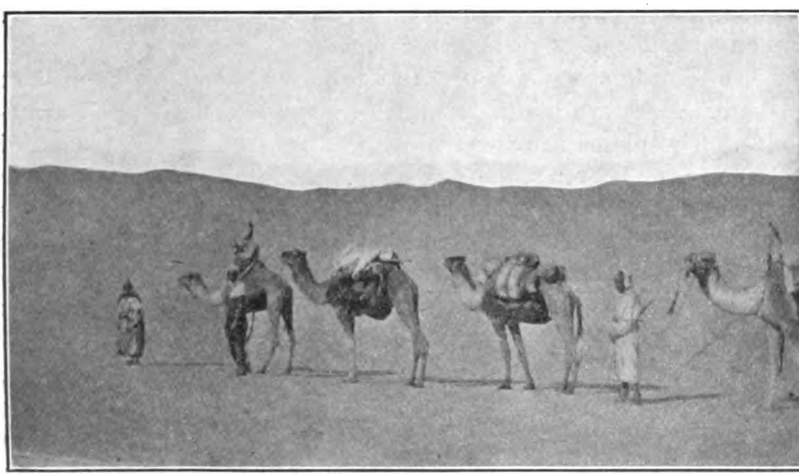

FIG. 2—Le More's caravan *en route*.

of this vast area should not be fairly well known. In addition, the marauding tribes which are even now a real menace to every crossing caravan, should by means of air scouts be better held in check and finally compelled to adopt a more acceptable means of winning a livelihood. It is with such ideas in mind that Le More undertook his long journey occupying thirteen months from Algiers, of which ten months were taken up in actual travel.

Le More began the journey at Ghardaia, the ancient capital of the M'Zabites and six days by *diligence* from Algiers. Ghardaia is in the midst of the northern edge of the Sahara and thus is

[1] D'Alger à Tombouctou: Des Rives de la Loire aux Rives du Niger. Plon-Nourrit et Cie., Paris, 1913.

surrounded by typical desert. Much of the activities of the dwellers there is characteristic of life in the larger oases. Here one finds strange oriental scenes, manners, and customs. There are large palm gardens and diminutive barley fields, where water is conserved to the utmost, and, chiefly, interesting markets in which one sees the products of the coast placed side by side with those of the far south. Here is wheat from the Tell, salt from the Oued Rhir, ostrich eggs and plumes from south of the Tanesruft desert, and dates from other oases, especially from Wargla. The small brown camel of Algeria and the large white Tuareg camel from the interior are seen and heard in all parts of the market square. Trading is carried on with great earnestness by the *bournoused* Arabs, and the hum of their conversation added to the groanings of the camels, the oriental dress, the scent of cookery and of incense, make up an *ensemble* of extreme picturesqueness.

The Ghardaia region is probably typical of much of the western Sahara. Here are plains on which lie low and flat-topped mountains. The plains are covered with stones, or pebbles, blackened "by fire from heaven", the Arabs say. At intervals one sees *oueds*, similar to the arroyos of the southwestern United States, which are usually dry but which at rare intervals are filled with a rushing torrent. Along the *oueds* there are flood plains often of considerable width, as at Ghardaia. Finally, dunes occur here and there by the Oued M'Zab. We thus have several physiographic formations which have received distinctive names at the hands of the Arabs. The fluvial deposits, possibly alluvial also, form the *reg* desert; the sand is the *areg;* the pebbly plain is the *hamada.* There are no *chotts,* or salt spots, of importance in the vicinity of Ghardaia. Of these distinct formations the *areg* and the *hamada* are the most intense deserts, usually supporting scant vegetation, if any. The part of the *chotts* most heavily charged with salts is also devoid of plant life, but the margins of the *chotts* bear characteristic halophytes. But, in the western Sahara, so far as is known, the *reg* is rarely, if ever, quite devoid of plant life. Some characteristics of the physiographic formations mentioned, as well as of the plants which are to be found on them, and of the Ghardaia-Wargla region, have already been given in the *Bulletin*[2], to which the reader is referred. In following Le More across the Sahara it will be seen that much of the country traversed by him is *hamada,* or mountainous, and that relatively little is *areg.* *Oueds* and their

[2] W. A. Cannon: Some Features of the Physiography and Vegetation of the Algerian Sahara, *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, pp. 481–489.

flood plains, *reg* desert, were followed for great distances, partly because of food for camels, and partly because dug wells occur only in connection with *oueds* or the *reg* desert.

LE MORE'S JOURNEY: GHARDAIA TO TIMBUKTU AND RETURN, NOVEMBER, 1910, TO DECEMBER, 1911

It chanced that the writer of this sketch was in Ghardaia at the time Count Le More departed on his long journey.[3] Although apparently well considered, the outfit seemed to the observer extremely meager for so great an undertaking. There were two servants, of whom one was cook and guide and the other the cameleer, two baggage camels, small beasts from the northern part of the desert, and one fine white riding camel (Fig. 2). The latter animal, a *mehari*, was a Tuareg camel probably from the Adrar region south of the Tanesruft desert. Of this outfit, both Arabs went to the journey's end and returned with the traveler, and the *mehari* came back as far as In Salah. Baggage camels were hired or purchased from time to time as required. Although the personal outfit of Le More was not increased beyond that above given, there were added to his caravan from time to time, as is the custom of the desert, various individuals and small caravans, joining forces for mutual protection against highwaymen, or for companionship. For much of the trip, however, his party traveled separately.

By the route followed two important oases were seen, El Golea and In Salah, and two French posts, Ft. Motylinski and Kidal. The position of these are indicated on the accompanying map (Fig. 1). Between these widely separated places there were seen a few Arab villages, but, for the most part, the wells visited were in the open desert and were used by nomads or caravans only, and were not the sites of the villages. Only one European—and he was a soldier on special duty—was encountered *en route*.

The first leg of the journey, requiring eight days' march, ended at El Golea, about lat. 31½°. Every 30 or 40 kilometers *bordjes* were met, which are fortified water stations, and the passage was accomplished with little incident. Along the *oueds* there was found sufficient pasturage for the animals.

El Golea is a prosperous oasis with an abundance of water.

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[3] As Le More had no camera, the writer persuaded him to take one of his kodaks with him. Le More did so and had remarkably good success when it is considered that he had no prior experience in photography. The accompanying views were made by him with this instrument. As Le More's book is not illustrated, these are the first pictures of his trip to be published. Their value is enhanced by the fact that views of the Central Sahara, especially away from the army posts, such as those of the Hoggar and the Tanesruft (Figs. 6-8 and 12-13), are not frequent.

Here are raised grains, vegetables and fruits; of the latter, the date is the most important. At El Golea, also, the French have established a post and maintain a small garrison.

Between El Golea and In Salah, about lat. 27°,—a journey which required 13 days of travel—the country is somewhat mountainous and probably the altitude somewhat higher than at El Golea. In the *oueds,* which wind about among the mountains, there is to be found a fairly dense growth of small herbaceous plants and shrubs, providing abundant food for the camels (Fig. 3). In addition to mountain topography, there are wide stretching plains, *hamada,* which, as is usual with this formation, is almost wholly barren (Fig. 4).

FIG. 3—In camp between El Golea and In Salah.

In Salah is an important oasis in many regards. It is on several main caravan routes, as, for instance, from Morocco to Tripoli and from southern Algeria to the Niger, and before the French occupation it was an active slave mart. At the oasis there is an army post,—the only important one in the Sahara (Fig. 5). The position of In Salah can be best appreciated, perhaps, when it is stated that by the present usual means of travel it would require one month to go from the oasis to Algiers, and, yet it is only on the threshold of the great desert!

Between In Salah, which is in the Tuat region, and the Niger by the route taken by Le More, there are about four great physiographic areas, namely, the mountainous region of the Hoggar (Figs. 6, 7 and 8), the Tanesruft desert, the Adrar mountains, and the

Tilemsi drainage area. The Tanesruft is the most intense desert of the western Sahara and lies in about lat. 22°. The two mountainous regions, Hoggar and Adrar, lie to the north and to the south of the Tanesruft. The Tilemsi River, practically a large *oued,* runs from the Adrar region to the Niger. After leaving In Salah, Le More's objective point was Ft. Motylinski in the Hoggar, a march of 29 days.

Beyond In Salah all caravans crossing to Timbuktu must be completely outfitted, and, also, they must be able to defend themselves against attack, as there is little law or order beyond the sound of French guns.

Le More's caravan was increased by two soldiers returning to

FIG. 4.—View on the *hamada* between El Golea and In Salah.

Ft. Motylinski, so that the little company mustered eight guns all told. The departure from In Salah was made on December 3. The season was most pleasant for desert travel. The daily temperatures ranged from 30° C. in midday to –3° C. at night, which is a range of about 60° Fahrenheit. Between In Salah and the Hoggar lies a desolate plateau, where for 80 miles or more, there are no wells,[4] and here, apparently *hamada,* there appears to be no vegetation whatever. In the *oueds,* however, shrubs are to be found. As the Hoggar is approached and reached the vegetation increases, until it is not inconsiderable[5]. The mountains attain an altitude of 6,000 feet or more.

[4] A. H. W. Haywood: Through Timbuctu and Across the Great Sahara. Lippincott, Philadelphia, 1912 [for review, see *Bull.*, Vol. 45, 1913, p. 57. Ed.].

[5] M. Chudeau collected 155 species of plants in the Hoggar, according to Battandier and Trabut, *Bull. Soc. Bot. de France*, Vol. 53, 1906.

On Christmas day Le More met the only European encountered *en route*. This was in the Hoggar. The man was a French sergeant in charge of a well-digging and cleaning squad of Arabs. The "puisatier" had been in the field three months without seeing a European. The meeting was a happy one to both parties! Thanks to the work of these men, water could be procured at least every three or four days in the Hoggar. About one hundred years ago, during a war between the Chambas of the northern Sahara and the Tuaregs, many of the ancient wells were filled, or otherwise destroyed. In this manner an impassable barrier was created,—a neutral zone which enforced peace. The wells are from 10 to 20 meters deep in the Hoggar and the water is usually good.

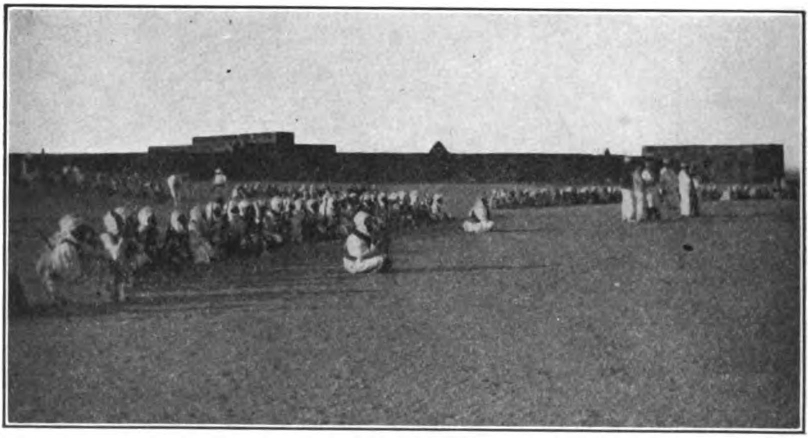

Fig. 5—Company of desert police, *méharistes*, watching artillery practice at In Salah.

Two small towns were seen in the Hoggar which are of a certain interest for different reasons. The first of these, Tit, is situated on a wide plain with mountains rising north of it to a height of 2,400 feet or more. The place is famous in desert warfare as the scene of a fierce battle waged between a few French and many Tuaregs, in which victory went to the French, and with it passed the control of the western Sahara. This was in 1903, since which time only isolated and unorganized bands of highwaymen, serious enough, to be sure, are to be encountered in the desert.

Not long after leaving Tit the village of Tamanrasset was seen. Tamanrasset is situated in a vast gravelly plain (*hamada ?*), which, however, is not so arid as this formation is usually (Fig. 9). Large tufts of shrubs or half-shrubs are scattered over its surface. At

the village live two men of importance—for very divergent reasons. Of these, one is Père de Foucault, otherwise known as the hermit of the Sahara. He is providence to all unfortunates, and is adored by Chambas, Tuaregs and the French alike. Formerly a French officer, Vicomte de Foucault, he joined the White Fathers, explored very largely the western Sahara, when, at times, he assumed great personal risk. It is said that at present he is engaged in compiling a Tuareg dictionary. Near Père de Foucault lives Moussa Agamastane, grand chief of the Hoggars, really sheik, who was formerly the active enemy of France, but who now as actively

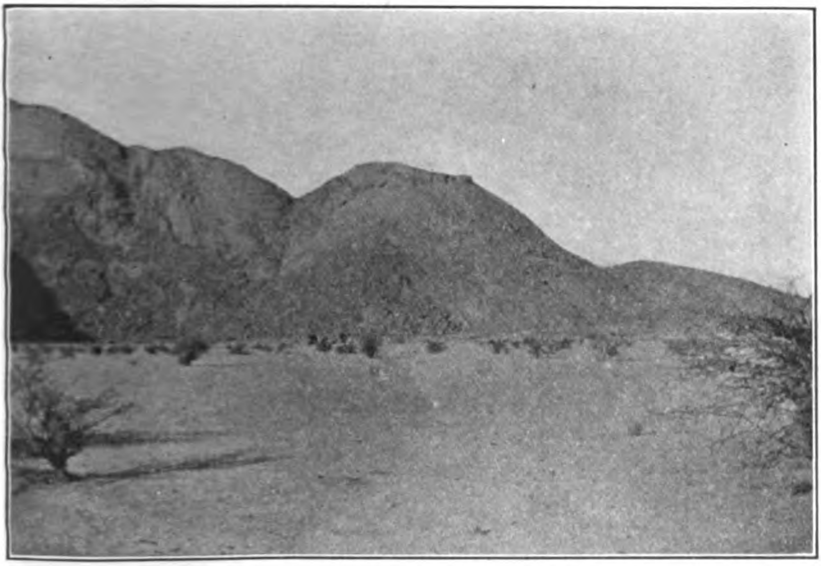

FIG. 6—View in the northern Hoggar region. Scene of Le More's meeting with the "puisatier."

supports the French (Fig. 10). Through the aid of Moussa companies of camel police, *méharistes,* have been organized to patrol this portion of the desert. He assisted, also, in the construction of Ft. Motylinski, on the southern edge of the Hoggar, where a post was built in 1909. The leading industry of the dwellers at Tamanrasset is the raising of camels, although the center of this industry is in the Adrar region, south of the Tanesruft.

In commenting on some customs of the Hoggar, Le More says that the women of the region have a very different standing from the women of the Sahara farther north. They are not veiled; in this they are like the lower caste Arabs, and they enjoy other wide liber-

ties. Property and the family name appear to descend through the female line. Much of the personal freedom, however, is lost on marriage. Monogamy usually obtains, although the chiefs may have more than one wife.

Immediately after leaving Tamanrasset the route passes through mountains, some of which are 6,000 feet high or more and are the highest in the region. The French post, Ft. Motylinski, in the southern Hoggar, was reached the first week in January, and a well earned a rest of ten days was enjoyed.

At Motylinski, where at the time ten French soldiers were sta-

Fig. 7—Gorge of Takumbaret, northern Hoggar region, three weeks from In Salah. The gorge is about 50 kilometers long and is usually less than 100 meters wide. It supports a shrubby vegetation, which, however, is rather sparse.

tioned and about a company of native troops under their command, the first definite news of highwaymen was received. Soon after Le More's arrival at the post an officer and his men returned from chasing a band of robbers who had plundered a caravan between there and Kidal. The robbers had killed several men and taken many camels. At the post Moussa Agamastane was seen and interviewed. The famous native chief understood only Tuareg, his secretary only Tuareg and Arabic. Le More talked only French, and his servant only French and Arabic. Although conversation under the circumstances dragged somewhat, Moussa was found to

be a very interesting man. His views on Paris, where he had been once taken by the French, and of French customs were very amusing.

Motylinski was left on January 15 and Kidal, beyond the Tanesruft was reached in 30 days. South of Motylinski the mountains became less high, the streams are fairly numerous, and irrigation is practiced to a certain extent by the Hoggars. Vegetation, especially along the *oueds,* is relatively abundant and the plants are of good size (Fig. 11).

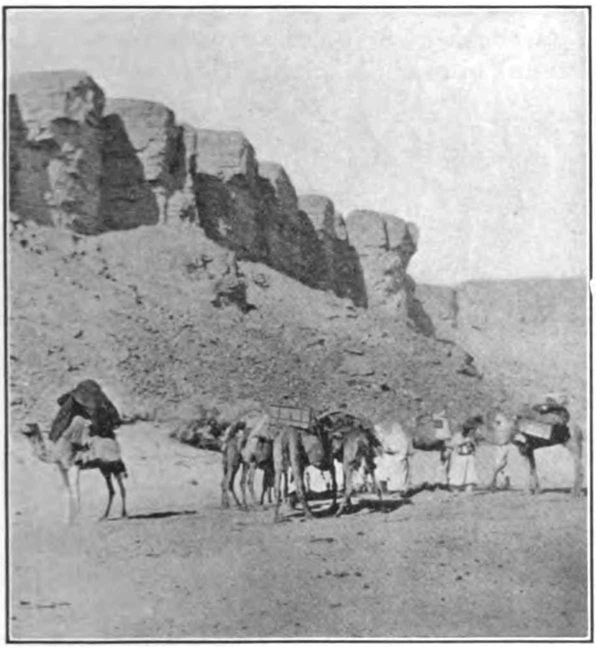

FIG. 8—View in the Hoggar region.

About two days after leaving Motylinski, le More reached a small Hoggar village, Tidjenoem, where he was well received and where he noted some interesting customs. The leading men brought him milk and eggs,—the latter being rare in the Hoggar. Domestic poultry holds a peculiar position amongst the villagers. They are a heterodox Moslem sect although, at present, there remain but slight traces of the deflection, and this is to be found in the attitude of the people towards poultry. Among the sect the cock is taken to represent the muezzin in announcing the seasons for prayer! As a result chanticleer, as well as his female relatives

and friends, enjoy great prestige. So much is this the case that poultry, or even eggs, are eaten only in case of real need. Therefore, the gift of eggs had, in the minds of the donors at any rate, not a little significance.

Upon leaving the mountainous Hoggar the country becomes more and more desolate. The tufts of herbaceous plants and of shrubs become less frequent and more stunted. Finally all plants appear to be left behind and a truly desertic zone is entered—the Tanesruft—which required 5 days to cross. The Tanesruft is perhaps the most extensive region without water in the western Sahara. It is part of an arid belt which stretches from the Lake Chad region westward to near the ocean. There appears, from the ac-

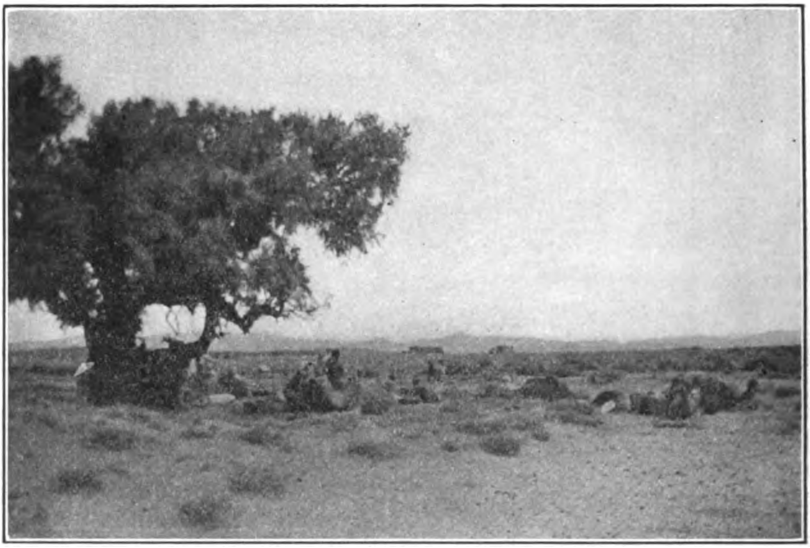

Fig. 9—General view on the plain at Tamanrasset.

counts left by some travelers across it, not a little variation in the topography of the belt. Somewhat to the east, the surface is a "sea of rocks",[6] and to the west "a monotonous stretch of sandy plain".[7] Where Le More crossed the Tanesruft it is described as being a level and sandy plain, where the sand storms may at times be very severe. The area, noticeably more arid than the surrounding portions of the Sahara, although thus extremely desertic in character, supports, nevertheless, some vegetation (Fig. 12). This, however, is extremely meager. It is true desert in all of its horror,—not a

[6] F. Foureau: D'Alger au Congo par le Tchad. Masson, Paris, 1902.
[7] A. H. W. Haywood: *op. cit.*

bird, not a sound, not even traces of the gazelle which is abundant in other parts of the great desert (Fig. 13). Although at present thus desolate, the region gives indication of having been inhabitated at a remote time. This is evidenced by the presence of prehistoric tombs. Around these tombs the Tuaregs have gathered curious superstitions, believing them the dwelling places of spirits. Le More says that when the women of a tribe are without news of overdue caravans, one of them clothes herself in her best garments, and, leaving everything metallic behind, lies near one of the tombs and believes that in answer to her prayers the mysterious host appears. He has, she says, eyes like those of the camel, and he reveals to her the fate of the absent ones.

Finally after having gone nearly 200 miles without water, five days' march, herbage again appears. Tufts of shrubs are seen

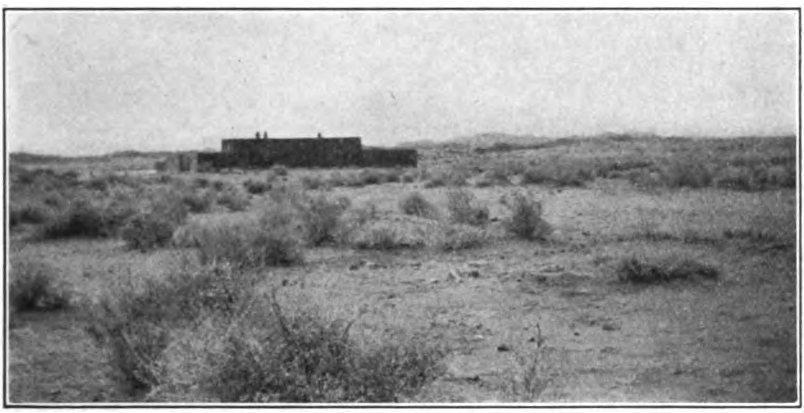

Fig. 10—House of Moussa Agamastane, chief of the Hoggars, at Tamanrasset.

and groups of trees curiously perched on buttes a few meters high. On the southern edge of the Tanesruft, also, there are rocks of fantastic shape, eroded by sand through wind action, which for several kilometers give a bizarre aspect to the landscape (Fig. 14). Leaving this region the Adrar is entered,—a mountainous country where the valleys are wide and the mountains are not as high as in the Hoggar. Vegetation is more abundant in the Adrar, and also, there is much game.

The Adrar had hardly been reached when signs of the presence of desert robbers were met, and Tuaregs were seen who had been attacked by them. The Adrar is especially subject to the ravages of highwaymen who come across the desert from Morocco, renew their stock of camels in this, the center of the camel raising industry,

and drive off other domestic animals. Le More's party, however, were extremely vigilant and escaped the notice of the robbers.

The Adrar ending sharply, the travelers emerged in a large valley, that of the Tilemsi, in which lies the road leading to Kidal, and ultimately to Gao and the Niger. The Tilemsi, thought to be the bed of an abandoned immense northward bend of the Niger, supports to-day much vegetation, and, in times past, the valley was probably well populated. At present, however, owing to the incessant raids of robbers, it is almost a desert.

Kidal was reached on February 15. This French post, like the one at Motylinski, has been recently established. It is an ancient

FIG. 11—View in a *oued*, to the south of Ft. Motylinski, southern Hoggar region.

village, possibly formerly inhabitated by negroes; to-day the huts of natives, Tuaregs, surround the post.

From Kidal to the Niger, the country is only semi-desert. Here the valleys, especially the Tilemsi, harbor much vegetation, including trees, and the vegetation increases in amount, and in size, as the Niger is approached. A curious condition was observed in the Tilemsi valley where there were zones of dead trees alternating with zones of the living. The killing may have been due to excessive drought, since Hayward, in describing the same phenomenon, remarks that no rain had fallen for five years.

Gao, on the Niger, was reached on February 25, and Timbuktu

on March 15, and the first half of the long and difficult journey was over.

Le More remained in Timbuktu until mid-July, during which time he made plans for the return over the desert, and recuperated from the long journey just completed.

On the route back to Algiers it was proposed to go over a portion of the desert hitherto little known to Europeans, and, possibly, never traversed by them. It was Le More's plan to return farther west than the southward journey, and to reach southern Algeria and the railroad at Colomb Béchar, on the Morocco-Algeria boundary. The route would be by Taudeni. The advantage of this route as a track for future caravans to follow, or for an aeroplane route, are mainly two, namely, it is the shortest way from the Niger to the

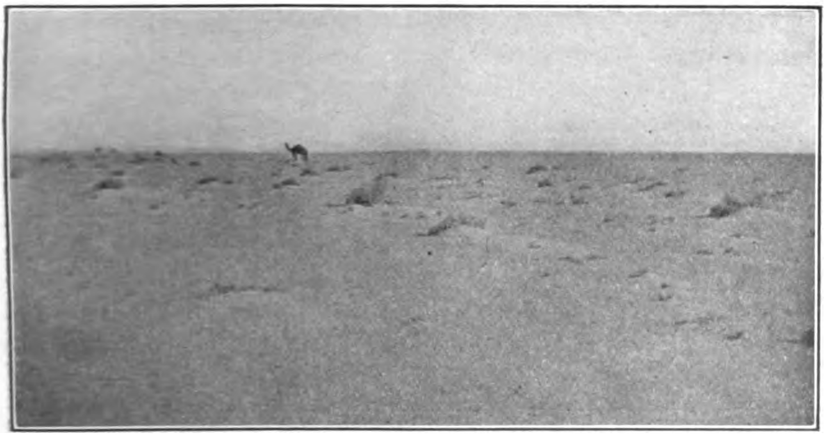

FIG. 12—General view in the Tanesruft desert.

southern terminus of the railroad, and it possibly includes the greatest number of oases. The disadvantages, as felt at the moment, lie wholly in the large numbers of robbers who frequent a portion of the route. Le More soon became aware of the real strength of the robbers. In attempting to engage men and guides for his return, he found great difficulty. All of the leading natives, merchants, *marabouts,* and chiefs of tribes counseled against the plan, and were very plainly either in direct league with the robbers, their secret agents, or feared offending them. It was only after much effort that a guide was secured and all arrangements made to return by the desired way. Upon reaching Gao, however, Le More was informed by the army that the robbers had been very troublesome of late and that he would not be permitted to return over the

route as planned. When the necessity of a change in plans became apparent, Le More, with the counsel of the French officers, decided to retrace his route to Kidal, but from there to In Salah to go direct and by a route not previously taken by Europeans. This way, as the accompanying map shows, lies to the west of the southward passage, and is much shorter. From In Salah northward the same route would be taken as was taken when south bound.

Leaving Gao on August 18, Kidal was reached on September 25. The first part of the return was made more difficult by reason of fever which Le More and his men suffered and by the summer heat. Summer is the season of rain in the southern Sahara, so that the Tilemsi valley had a luxuriant vegetation. The annuals were

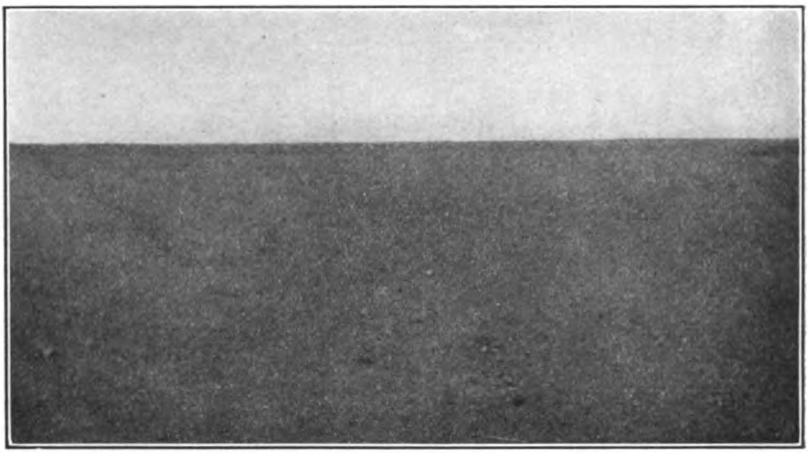

Fig. 13—General view in the Tanesruft desert.

abundant and attained a height of 30 to 40 centimeters. Such fertile zones were crossed by sterile ones, in which the summer vegetation was lacking. One day a prairie thickly covered with green vegetation was crossed, the next day a dusty and barren zone was encountered, to which there succeeded an open forest of spinose species (*Acacia ?*), which appeared in the distance green and in flower. No explanation was offered for this peculiar variation in the vegetation.

At Kidal there were rumors, soon confirmed, of robbers in the Tilemsi region. Tuaregs, loyal to the French, had been driven from their pastures by the brigands, and traces of these freebooters were to be seen everywhere. On this account Le More's little party had to be extraordinary careful, parking their beasts near camp,

remaining away, as much as possible, from wells, and maintaining constant watch.

One of the most common customs of the desert may be shown by an incident which took place not long after Le More left Kidal. A party of Tuaregs was encountered who had the intention of driving a band of sheep and camels to In Salah for sale. They had about given up the project because of danger to themselves and their charge when Le More was seen. Asking to be allowed to join his caravan, they agreed not to hinder his march in any way, and would aid whatever way possible. Thus, Le More became the *de facto* chief of a desert band, and distributing arms and ammunition among them, felt more secure against the robbers. The Tuaregs

Fig. 14—Effects of sand erosion between the Tanesruft and Kidal.

had about 400 sheep and 50 camels in their band, and it is interesting to note that, despite the very great hardships met in traversing the Tanesruft and the usual shortage both in food and in water, only about 25 of the sheep succumbed before arriving at their destination. On the Niger the sheep are worth about 2 francs, in the region south of Kidal they bring 4-5 francs, north of Kidal their value increases to 7-8 francs, and at In Salah they are worth 12-15 francs each.

Leaving the valley of the Tilemsi, after having traveled in it 13 days from Kidal, a small mountain range, parallel to the valley, was crossed and a wide valley entered. The latter became more and more desertic in character and led to the Tanesruft. In the rocky valley, whose floor is of sand and without vegetation, there are excellent wells, the last before entering on the dreaded Tanesruft. The

place of the wells is called Timissao. There are no dwellers at the wells.

Upon leaving Timissao the Tanesruft was entered and, after four days' forced marching, was crossed. At the place of crossing the desert was of sand, flat, and there were pronounced mirage effects. Apparently wholly barren, there were found occasionally broom-like shrubs which were eaten to the roots by the camels. On the third day a sandy barrier, running east and west, was encountered, which was 100 to 150 meters high and about as broad at the summit. Two other sand ridges of the same character were subsequently seen and crossed. These were about 40 kilometers apart. Between the two northernmost ridges Le More's party found the remains of a French officer who had been surprised and murdered by robbers a few months previously. The bones were gathered up and taken to In Salah for interment. Soon after crossing the last ridge of sand the rocky northern edge of the Tanesruft was reached and, on the following day, a pool of water high in the rocks was found (Adrar Nahlet). This water, however, was not accessible to the beasts, who had to endure another day before arriving at In Zize, where water was to be had in abundance.

In Zize is 18 days of march from Kidal and about 12 from In Salah. Like Timissao, to the south of the Tanesruft, there are no habitations of any sort at the well. Here, however, some vegetation is to be found, and the tracks of the gazelle are again met—certain indications of a more favorable climate.

Soon after leaving In Zize[8] Le More's Arab guests departed for a region of better pastures somewhat to the west. Grave danger from attacks by the robbers were over, and the party, increased by three Tuaregs who were going to In Salah to obtain certain permissions of the government, journeyed the balance of the way to In Salah in comparative comfort. The route went through a fairly rough country, where the valleys bore a relatively rich vegetation, and the wide plains, *hamadas,* were barren. Three days before being due to arrive at In Salah Le More parted with his baggage camels and made a forced march to the post. He was impelled to do this in part from desire to have a rest from the long and tiresome journey, and in part because his provisions were nearly exhausted. During the days of forced march, about 100 kilometers per day were made. At a point 20 kilometers south of In Salah the route

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[8] It is evident, from Haywood's account, that he crossed the Tanesruft from Timissao to In Zize along the route followed a few months afterward by Le More. But from In Zize their routes must have been different, since Haywood speaks of entering the Tanesruft a second time, while Le More passed through a rough country, really an extension of the Hoggar.

followed over a year before was first seen. In Salah was reached on November 8.

After resting a few days at In Salah the traveler pushed on to Ghardaia, where he arrived December 13, after having traversed about 2,400 kilometers of desert,—a fine record of endurance.

Le More's Direct Results and Conclusions

In addition to giving descriptions of new or little traveled parts of the western Sahara, glimpses of some of the customs of dwellers in the desert, and, among other things, some account of the climate during his sojourn in Africa, Le More gives notes on the sources of water on the route between Ft. Motylinski and Kidal, and between the latter place and In Salah. He gives also his impressions concerning the feasibility of conquering the desert by aeroplane, and outlines a new and shorter caravan route between Timbuktu and Algiers.

The extreme scarcity of water is well illustrated by Le More's notes. Between Motylinski and Kidal for example, out of the 21 days required to make the passage, water was carried 17 days. And from Kidal to In Salah, a journey requiring about 44 days, water was found at 12 places only!

Crossing the desert by aeroplane is considered by the author as feasible and highly desirable. He points out that an established aeroplane service would be of great military advantage to the French, making the subduing of the robbers less difficult, and uniting the French possessions on both sides of the Sahara. Also, it would greatly facilitate the carriage of mails and despatches. In place of requiring three months, as at present, 10 days should suffice to carry mail by aeroplanes from Timbuktu to the railroads in Algeria.

Finally, Le More suggests a new caravan route to the Niger, and proposes at some future time to traverse it.[9] This route would run from the end of the railroad at Colomb Béchar to Timbuktu by Taudeni, which is an important center for obtaining salt, and would reduce the distance between Biskra and Timbuktu from about 2,500 kilometers to about 1,800 kilometers, and would effect a proportionate saving in time. It is estimated that the passage via Colomb Béchar could be accomplished in 40 to 50 days by camel.

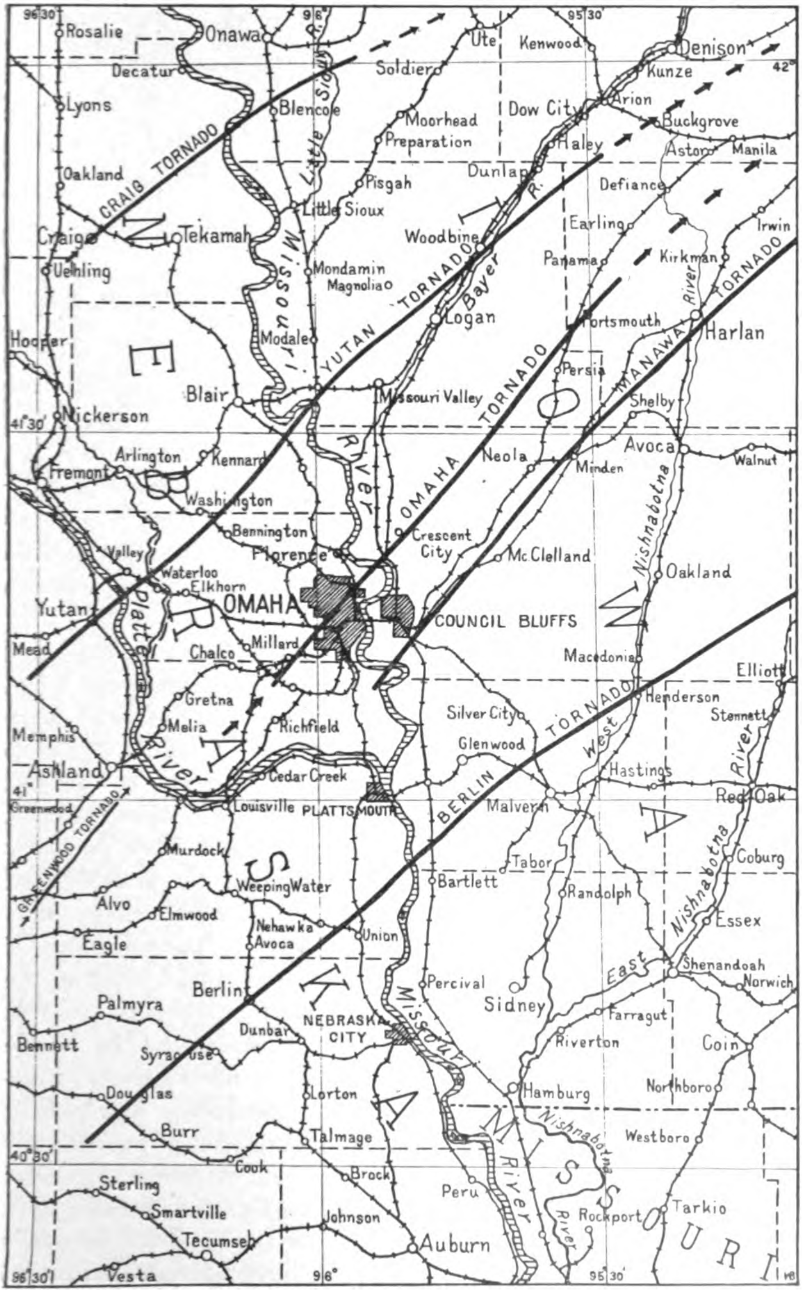
[9] Since the above was written, the unwelcome news has been received that Count Le More died of fever on October, 1913, at Gaboon, in the French Congo. The young explorer, who was 26 years of age at the time of his death, was on his way to the Congo from whence he planned traveling to Lake Chad, and from Lake Chad his route was to lie across the Sahara once more to Algeria.

THE IOWA-NEBRASKA TORNADOES OF EASTER SUNDAY, 1913

By G. E. CONDRA and G. A. LOVELAND
University of Nebraska

Unusual atmospheric conditions passed over Nebraska and Iowa on March 23, 1913, developing five tornadoes, which did more damage in Nebraska than all those previously recorded. Immediately after these storms a thorough survey of the districts affected in Nebraska was made under the direction of the Nebraska Conservation and Public Welfare Commission. The writers of this paper traveled over the tornado paths, mapped them, and observed the effects of the storm upon forests, farmstead improvements, towns, farm animals, and people. This paper briefly reviews the results of the field survey giving the distribution, phenomena and effects of the storms.

Weather Conditions. The tornadoes occurred as local developments in a cyclone of much energy and about average size which moved across the country from the Pacific coast to northeastern Michigan from March 21st to 24th. The morning weather map of March 23, 1913, shows the cyclone as a well defined area of low pressure covering the southern Rocky Mountain region, the center in northeastern Colorado with a pressure slightly less than 29.40 inches. This area moved eastward and slightly northward during the day, across Kansas and Nebraska, and twelve hours later, at the evening observation, 7 p. m., the center was in western Iowa, with a pressure between 29.25 and 29.30 inches. In the late afternoon, between 4 and 5 o'clock the center of the area crossed eastern Nebraska, not far north of Lincoln and Omaha. Between 5 and 6 p. m. a layer of very unstable air covered a large area, ten or twelve counties, in southeastern Nebraska. At that time the unusual appearance of the clouds indicated a violent disturbance in the upper atmosphere, that is, at the cloud level and above. The clouds were low and moving rapidly, of a weird greenish yellow color, tinged purplish in places and rolling or tumbling somewhat like boiling water. They were for the most part cumulus or strato-cumulus in formation, developing later into cumulo-nimbus. In a considerable part of this area a reddish dust settled from the upper atmosphere preceding the tornadoes. The dust was probably taken up from the ground by air currents.



Distribution of the Iowa-Nebraska Tornadoes of March 23, 1913.
By G. E. Condra and G. A. Loveland. Scale, 1:1,150,000.

The temperature was high during the afternoon of March 23d, but far below the record for that time of the year. The relative humidity, not unusually high, was between 75 and 85 in the morning and late afternoon, but fell rapidly with the rising temperature as shown by the trace sheet of the hygrograph at Lincoln. It was 53 at 3:50 p. m. and 78 only forty minutes later. The pressure and relative humidity both fluctuated very much between 4 and 10 p. m.

The barometer fell in southeastern Nebraska all day of March 22d and on the 23d until the time of the tornadoes. The fall was steady and not unusual, except that it was rapid on the 23d and to a very low reading. The fall at Lincoln on the 23d was .44 inch from 7 a. m. to the lowest reading at about 5:45 p. m., which was 27.94 inches actual pressure or 29.19 reduced to sea level. At Omaha the fall was .58 inch for the same time, the lowest reading being 27.93 inches or 29.09 reduced to sea level. This barometer was three-fourths of a mile from the track of the tornado and so recorded the pressure in the cyclone area rather than in the tornado path.

On the morning of the 23d in southeastern Nebraska the wind was from the south, with a velocity of eight to ten miles an hour, but it increased rapidly to between twenty and forty miles an hour by 9 a. m., remaining so until the time of the tornadoes. It then turned to northwest but continued high. There was no decided decrease in the regular southerly wind just preceding the tornadoes.

In forming the tornadoes the air of the lower layer probably moved upward, rapidly forcing its way through the mass of cold air that was moving northeastward in the upper atmosphere, thus causing considerable disturbance, as indicated by the movement of the clouds. If so, the storms were phenomena caused more by the turbulent air at and above the cloud level than by conditions in the lower levels, the tornadoes being lower manifestations of the violence in the upper air. They moved in a northeasterly direction, in parallel lines, because the upper atmosphere was moving rapidly in that direction. A light fall of rain or sleet immediately preceded the tornadoes at most places. A slight rain was general in southeastern Nebraska during the passage of the cyclonic area. The rainfall accompanying the tornado at the majority of places where it was measured was less than .5 inch, only exceeding .75 inch at a few places.

Five Distinct Tornadoes. We named the tornadoes from the

points of their greatest destruction. It is a remarkable fact that five distinct tornadoes (see map) moved northeastward in nearly parallel paths at about the same time in this cyclonic area with only ten to twenty-five miles between them, all crossing the Missouri River within a distance of eighty miles. It was difficult to obtain the correct time each passed a given point, and thus ascertain its rate of movement. From the data at hand, however, we conclude that the Craig tornado was slowest and that the others moved across the country at a rate of fifty to sixty miles an hour.

The counter-clockwise circulation of the air in the tornadoes was observed by many persons and was plainly shown by the distribution of debris in the storm paths. The tornado clouds were nearly cylindrical, of large diameter, and appeared short because the cloud level was low. They were nearly straight or slightly curved, moving with the lower extremity apparently dragging.

Craig Tornado. This formed about 5:25 p. m. a few miles southwest of Craig, Nebraska. It passed over part of Craig, and through rural communities to Iowa in a course of thirty miles. It was not violent in comparison with the other tornadoes, but demolished several buildings and killed eight people in Nebraska.

Yutan Tornado. This started at the ground level two miles east of Ithaca, Nebraska, at 5:30 p. m. We traced its continuous path of destruction over seventy miles. The width was one-fourth to one-half mile and evidenced extreme energy. Fortunately this storm narrowly missed several villages. It destroyed ninety-three sets of farm buildings and killed nineteen people in Nebraska. The greatest damage was in Yutan where fifteen persons lost their lives. Here about half of the town was demolished, yet so few were killed. A trunk was carried from Yutan to Iowa; likewise a vest and watch. A young woman, carried a quarter of a mile in the debris of a house, was uninjured. Just what destruction was wrought in Iowa is not known.

Omaha Tornado. Starting near Kramer, nearly sixty-five miles southwest of Omaha, this member of the series did not make a continuous path. It swept the ground for eight miles in the vicinity of Kramer, then rose in its course just south of Lincoln, but did some damage at College View and University Place. It formed a path beginning east of Prairie Home and extending to the Platte River. Near Kramer and southeast of Greenwood rural improvements were demolished, yet no people were killed. At the Platte the tornado lifted for a few miles. It reached the ground three

miles west of Papillion and moved across Ralston, Omaha and into Iowa. The Kramer, Greenwood, and Omaha tracks were made by one continuous storm, starting a few minutes before 5 p. m. and crossing the Missouri at 6 p. m. Persons in the country saw the clouds pass between the three well defined paths. Then too, the tornadoes had the direction and sequence in time that would suggest their relation.

This tornado destroyed about 27 groups of farm buildings in Nebraska and, in Ralston and Omaha, caused damage amounting to hundreds of thousands of dollars with a death list of one hundred people. It was not so violent as the Berlin or Yutan tornadoes and certainly did not show the energy and force exhibited in some other historic tornadoes. The three paths in Nebraska had a length of thirty-one miles, whereas the storm moved much farther than that in this state and Iowa. In Omaha a great many observations were made noting tornado phenomena. Numerous objects were collected for engineering tests at the University of Nebraska. These included pieces of trees, lumber, etc., that had been penetrated by other objects.

Immediately following the tornado, the city of Omaha and the districts affected by the other tornadoes were canvassed by insurance men and the tornado insurance written in a few weeks amounted to several millions of dollars. As a further means of protection many people also built storm cellars or caves.

Manawa Tornado. At 6:15 p. m., ten miles south of the Omaha tornado, the Manawa tornado was formed just north of Bellevue and moved northeastward nearly parallel with the other storms. It did practically no damage west of the Missouri River but was violent in Iowa.

Berlin Tornado. This, the most southerly of the series, developed at 5:55 p. m., about forty miles south and thirty miles west of the point where the Manawa tornado started. It was twenty minutes before the latter storm began, but at a point about forty-one miles from the Missouri River. The record shows that it did not reach Iowa until twenty-one minutes after the Manawa storm. The continuous path of destruction in Iowa-Nebraska was fully eighty miles long. Fifty-two groups of farm buildings were demolished in Nebraska and thirteen people were killed. Five persons were killed in Iowa.

The path of the Berlin Tornado was studied with great care. For the first eight miles it was weak. Here limbs were broken

from trees and buildings moved from foundations and damaged in a way that indicated a tornado. Farther on the path was practically continuous. Whatever was in the center was destroyed and near the edges was more or less damaged. The ground showed the effects of the severe wind. It had the appearance of being scoured much as if a swift stream of water had passed over it. The grass, cornstalks, and stubble, were left as if swept in a mighty tide in the direction in which the wind blew. The wire of fences was loaded with debris like that which floats in a water course at flood time, and in the center of the path fences were carried away, posts and all. The path averaged between one-fourth and one-half mile in width.

In the right zone of the storm path, objects were carried forward and inward, and in the left zone they were carried backward and inward. Some objects made complete circles in the storm. On the right, houses were lifted, moved northeastward, the northeast corners or sides striking the ground, as shown by marks in the soil. Then the houses were turned over, the wind entering through the bottom or places broken by the strain, and were crashed or blown to pieces and strewn over fields to the northeastward. Houses and barns on the left of the center moved into the storm from the opposite direction. This fact, that on the left of the center, some of the houses were pulled backward and inward, while on the right they were thrown forward and inward, caused many people to think that two storms had met, traveling in opposite directions. The fact that some buildings were thrown to the north and some to the south seemed to support this conclusion, but it is readily explained by the circular twisting motion of the tornado. It was observed that most of the destruction occurred on the east side of the center of the storm and that most of the debris was carried to the north and toward the center.

Evidence was sought of the explosive action so frequently given as a cause of house destruction by tornadoes. In a few cases the sides or parts of buildings seem to have fallen outward on account of a sudden decrease in pressure on the outside, but this evidence was not common. The debris of the houses was moved after the crashing and expansion had wrecked them, but inspection shows that crushing was the more important factor. Houses on the outer borders of the storm paths were damaged but usually not destroyed. They were partly turned or pulled from their foundations in the direction of the whirl with damage to the less resistant parts, such as porches, roofs, windows and chimneys.

There was strong suction, with upward currents in the storm. Doors were pulled outward from the grasp of persons in cellars and caves. Large animals including farm animals and people were lifted and carried considerable distances. The damage done by this tornado included the total destruction of 52 groups of farm equipment. Large buildings were completely torn to pieces, barns demolished, huge beams shattered, and stone fences scattered. On one farm 2,500 bushels of shelled corn absolutely disappeared and a crib with 4,000 bushels of unshelled corn was picked up and moved bodily. On the Sheldon farm, southeast of Nehawka, the damage to property amounted to $25,000. The house was torn down, three big barns and sheds, outbuildings, and fences were swept away; twenty-nine cattle, fifty-four hogs, one horse, and one person were killed. Chickens fared worst; hogs, cattle, and horses not so badly.

With the great destruction of property it is remarkable that only thirteen persons were killed in the Berlin Tornado. However, people caught in the open were usually injured or killed. Deaths were caused by people being blown against objects or being struck with flying debris. Of those killed all were in Berlin except three in the country who had not reached the protection of caves and cellars. Persons situated so that they could see and hear the approach of the storm and who hastened to cellar or cave usually escaped. Nearly all loss of human life was on the northeast slopes without outlook to the southwest. The cellar proved a safe place even when the house was blown away, the southwest corner being the safest position. On the smooth, open country the tornadoes were seen and heard quite a distance and the people probably had from two to four minutes notice of their approach, or time to reach places of safety. People in valleys or on north or northeast slopes taken without warning had less than thirty seconds, for the storm traversed a given point in that time.

We found that the testimony of those who were in the storm was not always reliable, for they received mistaken impressions and honestly reported what did not happen. One man sitting in his kitchen at Berlin felt sure that his house was lifted and whirled around many times. As a matter of fact, the house was largely wrecked but the kitchen was least damaged. On going out after the storm the owner could hardly believe his eyes, for he saw that the kitchen had not left its foundation. The house was near the center of the path. The impression was undoubtedly received from

observing the circular motion of moving articles outside through the window. From the great mass of testimony of eye witnesses and from our own survey and investigation the following very general conclusions may be drawn with respect to these great disasters:

1. The storms developed in the late afternoon during the time of highest temperature, which is the rule for the occurrence of severe thunderstorms and tornadoes in this part of the Mississippi valley. This made their approach noticeable and lessened the loss of life.

2. The tornadoes moved northeastward, sweeping the ground continuously for unusually long distances, forming well marked paths. Their movement was faster than that reported for most tornadoes.

3. In the vortex of at least three storms a velocity of 200 to 400 miles an hour was reached. This was determined by engineering tests of materials that had penetrated other objects. The velocity was so great as to cause soft objects to penetrate hard ones.

4. There was the least loss of life among occupants of buildings on high points with southwest exposure and the greatest loss among those on northeast slopes without outlook to the southwest.

5. Only two persons in the country and small towns were killed in a cellar or cave, in which case the house crashed upon the roof of an old cave.

6. The safety of the cellar or cave seems to be due to the fact that the people therein are below the flying debris which moves with such great velocity and force.

7. The explosive effect on buildings was much less than is usually supposed, the destruction resulting mostly from crashing of buildings against the ground or against trees and other buildings.

8. As a result of these storms, tornado insurance increased in popularity and many people in both city and country are now constructing storm caves.

A NOTE ON THE CLASSIFICATION OF CLIMATES*

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In the great variety of the world's climates it is essential that we have some classification, some grouping of like with like, some scheme of systematic correlation, which shall bring order out of chaos, and shall enable us to study and to describe climates in a rational and simple way. When, for example, we read the accounts of the war in the Balkans, or of the approaching opening of the Panama Canal, or of the sufferings of the wretched rubber collectors in the remote forests of the Amazon, the climatic environment in each of these cases has an immediate and live interest. We ought to be able to picture to ourselves the essential characteristics of that environment. More than that, we ought to be able to correlate the climatic environment in these three regions with other similar climates, in other parts of the world. Geographers in general, and those who have had the task of teaching climatology in particular, fully realize the great need, in their daily work and study, of a reasonably simple, rational and practical scheme of climatic classification, of a series of climatic "pigeon-holes," as it were, into which they can fit each climatic type with which they have to deal.

This subject is, in reality, a very vital one. It has, naturally enough, received much attention, from early times. On the one hand we have the various classifications of the zones, in which there are certain broad belts, divided by more or less east-and-west lines. On the other hand, when these zones have been subdivided to a considerable extent, we have our classifications of climates, our climatic provinces or regions. The dividing line between these two sets of classifications is impossible to fix. The zones of climate gradually merge into the climatic provinces. Under the zonal groupings we have the classic subdivision of the earth's surface on the basis of the distribution of sunshine, which dates back to the time of the early Greek philosophers, and which has given us our familiar five-zone division, so simple, so long used, so well known, and, in spite

*Cf. also, by the same author, "The Climatic Zones and Their Subdivisions" and "The Classification of Climates," in this *Bulletin*, Vol. 37, 1905, pp. 385-396, and Vol. 38, 1906, pp. 401-412, 465-477, respectively (Chapters I, II and III of the author's subsequent book "Climate, Considered Especially in Relation to Man," 1908, reviewed in the *Bulletin*, Vol. 40, 1908, p. 490). ED.

of its not according well with the facts of climate, still on the whole so satisfactory to the vast majority of people. The fact that these astronomical zones—i. e., the zones of sunshine—differ a good deal from the zones of heat, naturally led to the limitation of the climatic zones by isotherms rather than by parallels of latitude. Thus Supan[1] gave us his temperature zones, in which the mean annual isotherm of 68° and the isotherm of 50° for the warmest month are taken as rational boundaries, replacing an earlier and more complicated scheme[2], by the same authority, in which some less critical temperatures had been selected as limiting lines. Another classification of temperature zones was suggested by Köppen,[3] in which the length of time during which the temperature remains within certain fixed limits is taken into account, these limits having well-marked relations to the life of plants. Two critical (daily mean) temperatures, 68° and 50°, and the duration of these temperatures for periods of 1, 4 and 12 months, are the factors in this scheme, the temperatures not being reduced to sea-level. While this method of classification is rational in emphasizing the very important element of temperature, and the scheme is particularly useful in special studies of plant distribution, it is rather too detailed for general adoption. The grouping of the climatic zones according to the systems of the prevailing winds, as suggested by W. M. Davis,[4] has much to recommend it from a meteorological standpoint, for the great wind belts are associated with the great rain and cloud belts, and have their own distinctive climatic characteristics. But the classification by wind systems involves a shifting of the boundaries of the zones with the seasons which, while logical and natural, nevertheless does involve a good deal of confusion. Woeikof's compromise suggestion,[5] between the limits set by latitude lines in the Greek scheme and those set by the winds, loses some of the advantages of each of these schemes, and gains but little in return.

While a broad division of the earth's surface into zones is necessary as a first step in any systematic study of climates, as soon as a more detailed discussion is undertaken there comes an inevitable need of a more detailed climatic subdivision. Thus, we have the familiar grouping into continental and marine climates, with the

[1] A. Supan: Grundzüge der physischen Erdkunde, 5th edit., 1911, pp. 98-100 and Pl. VIII (originally published in 1896).

[2] *idem:* Die Temperaturzonen der Erde, *Petermanns Mitt.*, Vol. 25, 1879, pp. 349-358 and Pl. 18.

[3] W. Köppen: Die Wärmezonen der Erde., etc., *Meteorol. Zeitschr.*, Vol. I, 1884, pp. 215-226.

[4] W. M. Davis: Elementary Meteorology, 1894, pp. 334-335.

[5] A. Woeikof: Die Klimate der Erde, 1887, Part I, p. 327.

modifications in desert, littoral, monsoon, and mountain and plateau types. It is obvious that an almost infinite number of classifications of climates might be proposed, for we may take as the basis of subdivision either the special conditions of one climatic element, or similar combinations of two or more elements. Some of the suggested classifications are well known; others are practically unknown. In Supan's scheme[6] there are 35 climatic "provinces." Each is numbered and named, and its essential characteristics are briefly described. But there is no correlation between similar climates in different parts of the world, although, as is well known, many of the larger types recur on the several continents in fairly systematic fashion. Thus, in Supan's scheme, the characteristics of each province must be learned for and by themselves, although every careful student will himself recognize the points of resemblance in many cases, and will naturally come to associate provinces which have different numbers and different names together. Köppen[7] proposed an interesting classification of climates which depends upon certain values of the temperature and rainfall of the warmest and coldest month, or of the wettest and driest month, thus combining the two elements of precipitation and temperature. Five principal groups of plants constitute the major divisions, and these are subdivided until the whole number of "climates" reaches 24. The special conditions which characterize each of these climates are carefully determined, and each sub-climate is given a distinctive name. This elaborate scheme is too complicated for ordinary use, but it is of great value to students of plant geography. Then we have Penck's suggestion[8] for subdividing climates, not on a rigid meteorological basis, in which accurate observations are necessary, but according to certain large and readily recognizable features of surface form, of glaciation, and of the relation of evaporation and rainfall—a sort of "car window" classification of climates, both simple and useful; and de Martonne's new climatic provinces[9] and Hult's little-known and elaborate scheme[10] which includes more than 100 small provinces; and Ravenstein's "hygro-

6 A. Supan: Grundzüge der physischen Erdkunde, 5th edit., 1911, pp. 230-234 and Pl. XV (first published in 1903).

7 W. Köppen: Versuch einer Klassifikation der Klimate, vorzugweise nach ihren Beziehungen zur Pflanzenwelt, *Geogr. Zeitschr.*, Vol. 6, 1900, pp. 593-611 and 657-679, with Pls. 6 and 7.

8 A. Penck: Versuch einer Klimaklassifikation auf physiogeographischer Grundlage *Sitzungsberichte der Preussischen Akad. der Wiss.*, 1910, Vol. XII, pp. 236-246.

9 E. de Martonne: Traite de Géographie Physique, 2nd edit., 1913, Chapter VI of Section 2, with Carte des Climats (unaltered from first edition).

10 R. Hult: Jorden's Klimatområden, *Vetenskap. Meddelanden af Geogr. Föreningen i Finland*, Vol. I, 1892-93, pp. 140-201, with Pl. XVI.

thermal types,"[11] suggestive, but resting upon incomplete and unsatisfactory data. We ought also to make mention of the numerous classifications of rainfall types and seasons, such as that of Köppen, for instance.

It is obvious that, as noted above, there is really no limit to the number of such classifications, for there is no limit to the number of combinations of the various climatic elements which may be taken as the basis for the subdivisions. Some will prefer one scheme. Others will prefer another. There is, and there can be, no general agreement as to *the best.* Indeed, the whole matter is a difficult one. The fact that several of the authors who have given us carefully considered schemes have themselves changed their own maps is a pretty good indication that a fixed and satisfied state of mind is difficult to attain.

Among those who have given much careful attention to this subject of late years is Professor A. J. Herbertson, of the School of Geography, University of Oxford. In 1905 Dr. Herbertson[12] published his first map of so-called "Major Natural Regions," the basis of this classification being, not a certain definite value of a single climatic element, or of a fixed combination of two or more elements, but a certain unity of temperature, rainfall seasons, configuration and vegetation. The original scheme was somewhat revised in 1907,[13] and, if we are not mistaken, has been again slightly revised for the Oxford Wall Maps series.* The different types of natural regions recur in fairly systematic order on the different continents, being chiefly controlled by marine and continental influences, and each type, wherever found, has certain similar general relations to human life and development. This scheme, therefore, in which a particular type of natural region has the same number, wherever it is found, is especially helpful in all studies of world climatology, as well as in investigations of the economic and political history of mankind. The chief characteristics of each type having been learned, and the geographic distribution of the types being known, the grouping of the natural regions, while not exactly a classification of climates, is one of the best working schemes for a systematic study of climatology. The present writer can testify to the great value of this classification because of its rational, simple and effec-

[11] E. G. Ravenstein: The Geographic Distribution of Relative Humidity, *Report Brit. Assoc. Adv. Sci.*, 1900, pp. 817-818.

[12] A. J. Herbertson: The Major Natural Regions: An Essay in Systematic Geography, *Geogr. Journ.*, Vol. 25, 1905, pp. 300-312 (map on p. 308).

[13] The Senior Geography, Oxford, 1907, frontispiece.

* See, under "World," *Bulletin*, Vol. 45, 1913, p. 640. Ed.

tive correlation of climates and conditions of life. He has found it the best working scheme of all that have thus far been suggested.

In investigating the essential qualities of his different natural regions—the climatic characteristics which give them their distinctive effects—Dr. Herbertson has been making a special study of temperature conditions. The various steps which have been taken in this work, leading eventually to the construction of a new map of thermal regions, are briefly described in a recent paper on "The Thermal Regions of the Globe,"[14] this being the abstract of a paper presented at a meeting of the Research Department, Dec. 14, 1911. In all of his studies, Dr. Herbertson has been endeavoring to find out what are the best methods of representing the thermal conditions of the earth's surface for the use of geographers. It is no exaggeration to say that few investigators have extracted so many important facts from the ordinary isothermal charts.

In the course of his studies, Dr. Herbertson has constructed several different isothermal maps.† Beginning with the mean annual temperatures reduced to sea-level, and realizing that the ordinary isothermal map, with its many lines, is very confusing, a choice was made of three critical lines, those of 32°, 50° and 68° Fahr., and a mean annual temperature map was prepared with these isotherms drawn upon it. The selection of these particular isotherms is justified on several grounds, and we cannot help feeling that if teachers generally, in using the mean annual isothermal map in their classes, would emphasize the location of these particular isotherms (70° may be taken in place of 68° and 30° in place of 32°, if these are not on the chart in use), perhaps having them drawn in in heavier lines, their students would gain a clearer idea of the essentials of the map. Yet, as everyone knows, mean annual temperatures are unsatisfactory, indeed often misleading, for they do not give any clue to the seasonal variations Recognizing this fact, Supan, as above noted, in his map of temperature belts, used, in addition to the mean annual isotherm of 68° the isotherm of 50° for the warmest month, thus giving a very simple but rational series of temperature zones. Dr. Herbertson, going a step further, has published a map showing the thermal zones obtained by using the isotherms of 32°, 50° and 68° for the warmest and coldest months, and indicating these different zones by different styles of shading. This map (Fig. 3 of Dr. Herbertson) is made by superposing the Janu-

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14 *Geogr. Journ.*, Vol. 40, 1912, pp. 518–532.

† Reviewed under "World" in the *Bulletin*, Vol. 45, 1913, p. 80. Ed.

ary and July maps showing the 32°, 50° and 68° sea-level isotherms, a construction which we have ourselves used effectively in laboratory work in climatological instruction. Many of the most important facts as to range of temperature are clearly brought out by this method, and the student furthermore gains a clear idea of the seasonal migration of isotherms, and of the progress of the seasons. A further step, along the same lines, has been taken by Dr. Herbertson in the construction of a "thermal zone" map based upon the seasonal isotherms of 32°, 50° and 68°. This chart is not reproduced in the paper under discussion.

The maps just referred to concern sea-level temperatures. All meteorologists recognize the importance of sea-level isothermal maps in showing the large facts of temperature distribution; the effects of continents and oceans; of ocean currents and of winds; and appreciate the difficulty and uncertainty of constructing isothermal charts showing actual temperatures, not reduced to sea-level. Yet no serious student of geography can have failed to realize that sea-level isotherms are often most unsatisfactory, insufficient and misleading. One who has gained his knowledge of the climate of some moderately elevated region from sea-level isothermal maps alone, without allowing for the altitude, will, on actually visiting that locality, often experience a curious sensation of surprise and of disappointment, when he finds that his preconceived notions as to the temperature are quite erroneous. Thus it has come about that there has been a marked tendency of late years to chart actual air temperatures. Dr. Herbertson has made a valuable contribution to our existing series of isothermal charts by drawing the actual January and July isotherms of 32°, 50° and 68°, whose positions he determined (using contoured maps and allowing for the altitudes) with great care. The land areas are distinctively colored, and, for purposes of comparison, the sea-level isotherms of these same values have been included (Figs. 4 and 5). This method of showing actual rather than sea-level temperatures brings out several points of much importance. For example, the sea-level isotherm of 32° in January crosses North America from south of Vancouver Island to south of the Great Lakes, yet some of the sections with an actual temperature below freezing extend as far south as the sea-level temperature of 50°. Again, in Asia, the 32° line of actual temperature comes much farther south in Tibet than does the sea-level isotherm of 50°. In July, on the other hand, the actual isotherms show that Tibet has a relatively low temperature, a condition quite

different from that indicated on the ordinary sea-level isothermal chart. By superposing the January and July maps Dr. Herbertson was able to construct his chart of Thermal Regions (Fig. 7) which, together with the two monthly maps, has been reproduced, in colors, in the series of Oxford Wall Maps (60x40 inches). This wall-map we have found extremely useful in class-room work. A comparison, in the laboratory, between the sea-level and the actual temperatures is always an interesting and instructive exercise. Several striking facts at once impress themselves upon the mind. The relatively cool area over the East African plateau, within the "hot belt," and the extension of the area of "warm summers, cold winters" from northern Eurasia down into Tibet, are two of the most notable features. This map of thermal regions, then, comes much nearer the facts of existing climates than do any of the sea-level isothermal maps. Teachers of geography who want to present the real facts, rather than the somewhat ideal picture, will find it extremely useful.

In his endeavor to give still more information about the actual temperature conditions, "without undue complexity," Dr. Herbertson next proceeded to construct thermal maps to show the number of months with temperatures above 68°, above 50° and below 32°. The general idea, therefore, is not wholly unlike that embodied in Köppen's chart of temperature zones above referred to. From the available standard temperature-tables new tables were prepared giving the number of months with temperature over 68°, over 50° and under 32°. The numbers were then entered on large-scale maps, and the height of each station was noted on another set of maps. These maps were on tracing paper, to permit superposition. Next the line was drawn separating regions where at least one month has a mean temperature of 50° and those where no month has such a temperature; and so on. Where mountainous countries were being dealt with, valleys and plateaus, not the highest parts of the ranges, were considered. Figure 7 of the paper under discussion shows the results, the land areas being shaded to indicate the different numbers of months (1, 3, 5, 7, 9, 11) with temperatures over 50°. Dr. Herbertson points out that the line between three and four months over 50° is important, because it indicates roughly the northern limit of profitable wheat-growing, at least in eastern North America. Another map, showing the number of months over 68°, and one showing the number of months under 32°, were also prepared, and from these three a new map of Thermal Regions (Fig. 8)

was constructed, which is perhaps the most complete representation of the actual temperature conditions of the world on a single map hitherto published. There are in all fifteen different regions (one embracing all lands over 4,000 meters in altitude), which differ from one another in the numbers of months with temperatures over or under 32°, 50° and 68°. In spite of the number of regions, the map is singularly clear and distinct. It is difficult to imagine how mean monthly temperatures could be more clearly and effectively shown on one map than is here the case. The region where no month has over 50° coincides roughly with the tundra. An important region is the one with at least four months over 50°, and with four or five months below 32°. In passing from the continental interiors westward the number of months over 50° does not change, but there is a decrease in the number of months with frost. While central Europe has less than four months of frost, western Europe has no month with a mean temperature under 32°. There is nothing in eastern Asia corresponding with the British Isles, France and the Low Countries of Europe, but we find that same milder northwestern European region in western North America, in southern South America, in Tasmania and in New Zealand. In North America the zone with from one to three frosty months but with at least three months over 50° marks roughly the northern limit of corn cultivation. In Africa the altitude gives areas within the great hot belt which, Dr. Herbertson says, "are distinctly more temperate than any other part of this belt except in the Andes." There are many other points of interest which might be referred to.

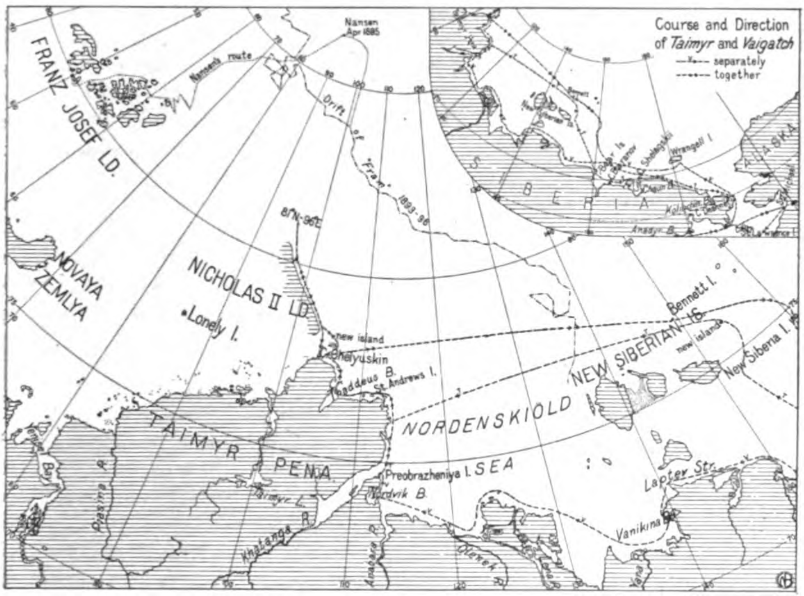
In considering Dr. Herbertson's new map of thermal regions, it seems to us that both in his selection of the critical monthly temperatures, and in his working out of the thermal regions, our author has shown excellent judgment. It must be obvious to everyone that the duration of these critical temperatures is of great importance in the distribution of vegetation and of crops. We feel sure that physicians and many others who have a peculiar interest in temperature will find the map most useful, and that teachers of geography will be able to bring out many important facts by their use of it in their classes. For a quick determination of the essential temperature conditions of any region, the new map is admirably adapted. There are, of course, several points which may be urged on the other side. There are manifest difficulties, which our author recognizes, in constructing the map in regions where there are great differences of altitude, and it would, per-

haps, seem wiser not to attempt to introduce quite so much detail in a map which cannot, for ordinary use, be on a very large scale. Botanists will probably say that they have more interest in extremes of temperature, and in the seasonal rise and fall, or in the diurnal variability, than in the monthly means. Other persons will say that the temperatures without the rainfall mean little. Others, again, will ask for data regarding cloudiness, or evaporation. But, as we have said, these maps are maps of thermal regions, and they lay no claim to being anything else. And, moreover, we understand that Dr. Herbertson's object in constructing them was primarily in order that there might be discussion of the different methods by which the temperature conditions may best be represented for the use of geographers. For our own part, we feel under great obligations to Dr. Herbertson for his painstaking work on these numerous temperature charts, and especially for his emphasis upon the importance of the actual as contrasted with the sea-level temperatures. Those who have spent most of their lives in becoming familiar with sea-level isotherms will have a wholly new and a far more rational view of the world's temperatures as the result of their familiarity with Dr. Herbertson's work. The more widely his charts are known and used, the clearer and the more accurate will be our meteorological knowledge. It is a fortunate circumstance that the January and July actual temperatures, and the thermal regions map based upon them, are already available in the excellent series of Oxford Wall Maps. We hope that the new thermal region map, based upon the numbers of months above and below certain temperatures, will soon be added to the Oxford Series.

We sincerely hope that Dr. Herbertson will continue his interesting studies, and will, before long, be able to give us, in brief numerical form, the essential climatic characteristics of his Major Natural Regions. With that addition we believe that his scheme of subdivision of the earth's surface into "natural regions" will meet the needs of most geographers who are in search of a rational, simple, "working" classification of climates.

NICHOLAS II LAND*

Brief reference has been made in *The Times* to the discovery by the Russian Hydrographical Expedition of a large island in the Arctic Ocean. Captain B. A. Vilkitsky, the leader, has sent the Admiralty an extract of the log, of which a translation is given below. It will be seen from it and from the accompanying map that some highly interesting oceanographical and other problems have been suggested or solved by the discovery.



Sketch Map of the Arctic Ocean North of Siberia Showing the Newly Discovered Nicholas II Land. Scale, 1:22,700,000. On both the main map and the inset the routes of the *Taimyr* and *Vaigatch* are shown by broken lines, double arrowheads being used to show their direction when sailing together, single arrowheads, with the initial of the respective vessel, when sailing separately. On the main map the drift of the *Fram* and Nansen's sledge journey are also shown for comparison.

An explanation is furnished thereby of the northerly curve described by the drift of the *Fram* during the Nansen Expedition of 1895-96. Judging by the distance that separates the northern limit of the explored coast and the *Fram's* drift, it is not impossible that the new Emperor Nicholas II Land may extend beyond the 200 nautical miles explored by Captain Vilkitsky, and prove to be the nearest land to the Pole.

How far it may extend westward remains a matter for conjecture. We have no records of exploration in the waters to the east of Lonely Island. But the

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* Reprinted from *The Times*, Russian Supplement, No. 6, London, Dec. 15, 1913, supplemented by Gen. Schokalsky's account in the *Geogr. Journ.* for January (Vol. 43, 1914, pp. 64-65).

presence of the land discovered by Captain Vilkitsky is sufficient to account for certain peculiarities of the Kara Sea. The conditions of the ice and of the currents and the salinity of the water in this sea have long suggested the theory that some very substantial obstacle stood between it and the Arctic Ocean. In 1882 Lieutenant Hovgaard, of the Danish Navy, actually sailed for Cape Chelyuskin to discover land to the north of the cape. He was, however, unable to reach the Taimyr Peninsula. The three expeditions that have successfully weathered Cape Chelyuskin—Professor Nordenskjöld in the *Vega* in 1878, Professor Nansen in the *Fram* in 1895, and Baron Toll in the *Zaria* in 1900—all failed to note even the appearance of land to the north, although, as Captain Vilkitsky now shows, an island lies not more than 20 miles away from the course steered by the expeditions.

And now a few words about the character and purpose of the Vilkitsky expedition. Some four years ago the Russian Government built and commissioned two small ice-breakers, the *Taimyr* and the *Vaigatch,* to proceed to the Far East, and thence, after surveying the northern waters, to go westward to the Murman coast. The idea was to settle the vexed question raised by the war with Japan as to the practicability of the northern passage for warships. Captain Vilkitsky, undaunted by the presence of unbroken ice off Cape Chelyuskin, which had caused his predecessor last year to recoil, tried to make the westward passage by skirting the barrier, and thanks to his pluck and persistence he was rewarded by the present discovery, adding one more to the long list of Russian exploits in the Far North.

Log of the Expedition

Having coaled and taken water from the *Argun* in Anadyr Bay I put to sea on August 4. On the night of August 6 we touched at Cape Deshnef (East Cape) and repainted the cross there. The transport *Vaigatch* laid her course towards Wrangell Island in order to ascertain the condition of the ice, while the *Taimyr* steamed along shore. During the cruise we took international meteorological observations. On the following day the vessels were among scattered ice and met the Norwegian steamer *Kit* walrus hunting. We lent her a chronometer and gave the crew some fresh fish. Along the meridian of Wrangell Island the ice was gathering. I received a wireless message from the *Stavropol,* which had been caught in the ice, and from the *Vaigatch,* which had failed to make Wrangell Island by five to ten miles because of the ice.

On August 9 the *Taimyr* forced her way to clear water and was off Cape Shelagskii. While awaiting the arrival of the *Vaigatch* we sounded Chaun Bay. On August 12 the *Vaigatch,* having made the meridian of Chaun Bay, met the *Stavropol* there and transferred the Kolyma-bound mail to her. The *Taimyr* was three days forcing her way through the ice until she was off Cape Baranov.

On August 15 we reached clear water. Having passed the Bear Islands we rejoined the *Vaigatch* and proceeded further—the *Taimyr* on a hydrological survey around the New Siberia Islands, the *Vaigatch* to complete our soundings along the coast. The rendezvous was at Transfiguration (Preobrazheniya) Island. On August 17, while skirting the broken ice thirty miles off the New Siberian coast, we came into shallow water.

Discovery of an Island. It was August 20 before we succeeded in finding a way northeast to the open sea. We then discovered a new island of volcanic

origin several miles in circumference. We raised the national flag, surveyed the island, killed some white bears and walruses, and went on. On August 21, while taking the great circle course towards Taimyr, we came off Bennett Island; on August 23 we reached the mainland in lat. 76°. There had been clear water all these days and a clear horizon, but we had seen nothing of the conjectured Sannikov Land. We turned south and joined the *Vaigatch* at Transfiguration Island that evening. We landed a shooting party which killed two reindeer and some bears. The *Vaigatch* had completed the soundings in Laptev Strait on August 17, keeping as far possible south of thirty-five-feet depths. On August 18 she had reconnoitred Vanikina Bay, the entrance proving unsatisfactory. On August 21 she began the survey of the mouths of the Olenek and Anabara, but contrary ice compelled her to stand away from the coast. On August 22 the *Vaigatch* entered Nordvik, sounding the southern coast of Begitchev, where sharply-varying depths were found. Coming to shallows boat soundings were taken, but the water shoaled suddenly and the vessel touched a sandbank. On August 23 she floated off with the tide, surveyed the eastern coast of Begitchev and arrived at Preobrazheniya Island.

On the morning of August 24 the *Taimyr*, after adjusting her compasses, steamed northward for coast survey. The *Vaigatch* proceeded to explore a large bay in latitude 75° 50′ N. On August 25 she grounded on a shoal fifteen miles up the bay and could not get off till the *Taimyr* came to her assistance, on August 26, after completing her survey as far as latitude 76°30′ N. During the night the *Taimyr* took water from her consort and towed her off with the tide. We found cooking stoves at the entrance of the bay and further in, probably built by Khariton Laptev. The *Taimyr* continued coast survey work, while the *Vaigatch* took an astronomical observation and surveyed the islands. The observation was made on St. Andrew and St. Samuels Island. Thence onward we began to encounter ice.

On August 30 and 31 the *Taimyr* sounded in Thaddeus Bay to twenty-foot depths. The *Vaigatch* continued her coast and island survey. The ice was gathering. On September 1 we completed the survey of Cape Chelyuskin by taking cross bearings at a distance of six miles off shore. Both transports were stopped by solid ice and tried to skirt it.

The New Land. Thirty nautical miles northeast of Cape Chelyuskin the expedition discovered an island which was free of ice to the east. This island extends along the parallel, and its width at the eastern extremity is seven miles. After surveying the accessible part of the shore, the expedition skirted the edge of compact ice, encountering separate icebergs and broken ice. At daybreak on September 3, thirty nautical miles from the eastern point of the newly discovered island, we sighted the towering heights of an unknown land; seven miles off shore we sounded depths of 700 ft. The *Taimyr* proceeded to survey, while the *Vaigatch* stood off trying to get an observation.

The land proved to be of volcanic origin, containing extensive glaciers. On September 4 we landed at lat. 80°4′ N., long. 97°12′ E. I raised the Russian flag and declared the land annexed to his Imperial Majesty's dominions.

The evening of that day we raised anchor and went further north seeking a passage. The broken ice began to gather. On our way we surveyed the northeast shore of the new land for a distance of 20 miles. On the morning of September 5, in lat. 81° N., long. 96° E., we found unbroken ice on all sides. The soundings showed 116 ft. to 700 ft. We put back. On September 6 the

expedition returned to Cape Chelyuskin. The ice had not changed. On the next day we again went to the newly-discovered island. Ice was sweeping in from the east. The barometer was rising fast. On September 10 the *Taimyr* once more returned to Cape Chelyuskin. The east wind had broken up the ice somewhat, so I sent a land party under Dr. Starokadomsky and Lieut. Lavrov over the ice to discover how wide the ice barrier was. On September 11 the *Vaigatch* rejoined us, for the ice was beginning to block the island. We drilled the ice [at Chelyuskin] and found it to be three to four feet thick. The party reached the shore at the spot where the *Zaria* expedition mark stands, and after putting up a mark on Cape Chelyuskin itself went further on. The end of the icefield was not to be seen, but its width was at least forty miles.

The Voyage Continued. On September 11 the land party returned to the ship. We attempted to break our way through the ice, but succeeded in making only five miles in twenty-four hours. Our diminishing coal supply, the necessity of cleaning out our boilers, and the lateness of the season compelled me to put back to Vladivostok. While anchored off Cape Chelyuskin we killed a few more bears. On September 12 we headed [for the east] by the great circle route: For three days we encountered separate fields of ice and skirted them to southward. On September 18 we were off Bennett Island. I then learned that the *Taimyr's* condenser pipe had burst, and salt was filtering into the boilers, as their usual cleaning-time was overdue. Strong south winds prevailed.

Taking shelter under the northern shore of the island I sent a land party headed by Dr. Starokadomsky to look for the collection left by Baron Toll. They erected a cross on Cape Emmelina, in memory of Toll and his followers. The collections, weighing seven pouds (252 lbs.) were found; they included fossils, impressions of plants, and a mammoth tusk.

• †[On September 22 the wind became lighter, and the expedition surveyed the island and started south. It was intended to take the great circle route to Wrangell Island, but the heavy ice obliged the expedition to go by zigzags about 300 miles along the meridian of 160° E. Sometimes the ships met new ice, and it was very difficult to pick their way during the darkness of the nights. On September 25 they came to open water and immediately trawled for zoological purposes.

The next day the expedition met the ice up to the meridian of Chaun Bay, but the water was open from 70° N. and 180° E. On September 29 the ships reached Koliuchin Bay and surveyed it. They started on October 3, but a heavy gale compelled them to anchor; the route was then continued to Cape Deshnef. On the 22nd the cape was passed, but 40 miles from Providence Bay a heavy storm caught the ships, which rolled about 55° and the speed against the wind was not more than half a knot. In the night the tiller-rope of the *Taimyr* broke, and only the next night could the ships approach the shores of St. Lawrence Island. On October 9 the expedition was at St. Michael, Alaska, and on October 27 at Petropavlovsk in Kamchatka, from which this report was sent by wireless.]

The expedition has made extensive botanical, geological, and zoological collections. During the entire cruise we made soundings and conducted meteorological and hydrological observations. As far as possible, at interesting points, we maintained hydrological stations, and at astronomical points we determined the magnetic declination.

† These two paragraphs are taken from the *Geogr. Journ.* for Jan., 1914.

THE CONFERENCE ON GEOGRAPHICAL EDUCATION HELD DURING THE TRANSCONTINENTAL EXCURSION OF 1912

Toward the end of the Transcontinental Excursion of the American Geographical Society, on October 12, 1912, a conference on geographical education was held on the initiative of Professor W. M. Davis at the University of Virginia in Charlottesville. This was a fitting corollary to the other activities of the excursion, for the majority of its members were educators and the advancement of geography through personal contact between European and American geographers was one of its main objects. Five European geographers made addresses on the teaching of geography in the universities of their respective countries; two American geographers were to make similar addresses on the status of geographical education in this country, but were prevented by lack of time. The European geographers who spoke were: Professor Joseph Partsch of the University of Leipzig; Professor Lucien Gallois of the University of Paris; Professor Eugen Oberhummer of the University of Vienna; Professor George G. Chisholm of the University of Edinburgh; and Professor Emile Chaix of the University of Geneva. The two American geographers who were unable to speak were: Professor Albert P. Brigham of Colgate University, and Professor Mark Jefferson of the State Normal College at Ypsilanti, Michigan. All seven addresses have recently been made accessible in the *Proceedings of the Philosophical Society of the University of Virginia*, 1911-1912, pp. 99-134.

Before introducing the speakers Professor Davis made a few remarks in which he pointed out that the standard of a subject in elementary and secondary schools is dependent on the status of that subject in the higher institutions of learning; hence the necessity of developing geography as a university subject in this country if we wish to improve its condition in the schools.

Professor Partsch in his address referred to the fact—which is not familiar to all who know of the present advanced development of the subject in Germany—that geography began to be recognized as a university subject in Germany only about forty years ago. Now every one of the eighteen universities has its chair of geography and several of the *Technische-* and *Handelschochschulen* as well as the *Kolonialinstitut* of Hamburg have special geographical professorships. In all there are 29 professors and 15 instructors (*privatdozenten*) of geography at German universities. Professor Partsch then spoke of the methods of instruction. Each university has its geographical institute; its equipment depends on the size of the endowment. As a rule the equipment consists of a collection of simple surveying instruments, and facilities for map drawing and cartometry; a collection of illustrative material such as maps, models, photographs and lantern-slides; and a library of text-books, handbooks and geographical journals.[1] Instruction is given by means of lectures, seminar work and field excursions.

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[1] Cf. also "Die geographischen Institute der deutschen Universitäten" by F. Regel, *Geogr. Anzeiger*, Vol. 10, 1909, pp. 149-158, 177-184, and 212-213.

Professor Gallois's address, while dealing with the teaching of geography, gave a welcome insight into the French educational system, a somewhat confusing subject to those who are not familiar with it. Geographical instruction along modern lines dates back to the reorganization of the French universities, thirty years ago. The traditional combination of history and geography led to assigning the chair of geography in each university to the *Faculté des Lettres.* Nevertheless, the subject is taught throughout on the basis of natural science. At the University of Paris a professorship of physical geography was created about twenty-five years ago under the *Faculté des Sciences,* so that at this institution physical geography is represented in both faculties, inasmuch as physical as well as human geography is taught in the *Faculté des Lettres.*

The great majority of students of geography at French universities intend to become teachers in state secondary schools, or *lycées,* and geography is associated with history in these schools. The course of study usually covers four years or more, two for the *license,* one for the *diplôme d'études,* and one or more for the *agrégation.* While all three of these certificates—for they are not, strictly speaking, university degrees—are conferred for studies in geography and history together, the elective character of the examinations for the first two allows the candidate to devote himself almost exclusively to geographical subjects, if he so desires. The *agrégation,* however, which is a difficult competitive examination to fill vacancies in the secondary schools (there are only about 10 to 18 a year) lays great stress on history, the written examination comprising three papers in this subject and one in geography. Those who intend to become university professors may dispense with these three certificates; they must, however, have the doctor's degree. The only condition imposed upon a candidate for this degree is the writing of an original thesis on some subject accepted by the faculty. The thesis always requires several years of work; it is not a student's essay but an original piece of work representing a substantial contribution to science. For those, especially foreigners, who wish to acquire an academic degree which does not lead to a state position and who wish to devote less time to its acquisition, a so-called *doctorat d'université* has been created comparatively recently, for which a thesis of the same character but less comprehensive in scope is required.

In his remarks on geographical instruction in Austria, Professor Oberhummer called attention to the identity in development and organization, due to historical reasons, of the Austrian and German universities. No extended reference to the geographical work given in the former need therefore be made here. One innovation may be noted, however. In 1885, the chair of geography at the University of Vienna was divided into two chairs of equal rank, one for physical geography and one for political or historical geography, in recognition of the fact that the subject was too comprehensive to be taught by one man alone. The total number of geographical instructors at the higher institutions of learning of Austria is 16, viz. 10 professors (including one at the *Exportakademie* in Vienna) and 6 *privatdozenten.* Briefly alluding to secondary education, Professor Oberhummer pointed out a recent advance in the status of geography in the Austrian schools. While heretofore in the *gymnasien* (which represent the most important class of secondary schools) geography was confined to the four lower (out of a total of nine) classes, as it still is in this type of school in Germany, the subject has recently been added to the curri-

culum of the upper classes, so that there will be no break in the course of study for those who wish to pursue the subject later on at the university.

The next speaker, Professor Chisholm, gave an interesting historical account of the development of geography in the British universities. The first successful movement made with a view to getting university recognition for the subject was made by the Royal Geographical Society of London in 1885. Dr. J. Scott Keltie, its present secretary and at that time sub-editor of *Nature*, was commissioned to investigate geographical instruction on the Continent. His well-known report[2] greatly stimulated the agitation for the movement. Not long after, in 1887 and 1888, respectively, readerships were founded at the universities of Oxford and Cambridge, the Royal Geographical Society making in each case a contribution to the salary of the reader. Since then the recognition of the subject in British universities has steadily increased. It is still best represented, however, at Oxford. The course given there at the well-known School of Geography under the direction of Professor A. J. Herbertson requires two years of study and leads to a university diploma in geography. The curriculum embraces the whole field of general geography and the outlines of the regional geography of the world, with special emphasis on the British Empire. The examination for the diploma, besides covering these subjects, includes the preparation, based on the literature available and on personal observation, of a systematic regional treatment of a small area, usually the area comprised in a sheet of the one-inch-to-the-mile map of the British Ordnance Survey, and calls for a special knowledge of two subjects to be selected by the candidate from the following: detailed regional geography of some country; climatology; geomorphology; biogeography; economic and political geography; modern historical geography; ancient historical geography; and history of geography. The teaching staff of the school now comprises three persons, in addition to its head, who give their whole time to it; there are also a lecturer on ancient historical geography and an instructor in surveying. The students are mainly school teachers, many of them graduates, but there are also intending candidates for the Indian Civil Service and other examinations.

There is a similar school of geography at Cambridge, with two readers; the requirements for the diploma do not, however, include the preparation of a geographical monograph.

In no other British university is any special qualification in geography granted. The subject, where it is recognized at all, is recognized only as one of several subjects included in the examination for a degree, whether in science or arts.

Of the newer universities of England the University of London, since its reorganization as a teaching body, has, however, devoted considerable attention to geography. There are now at least four recognized teachers of the subject at the constituent or affiliated institutions, viz., two at the London School of Economics (Professor H. J. Mackinder is head of the department), one at University College and one at Bedford College. In 1912 the University of London conferred for the first time in any British university the degree of

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[2] Geographical Education: Report to the Council of the Royal Geographical Society, London (Murray), 1886. Summary in the *Report of the Commissioner of Education for 1896-97*, Vol. 2, pp. 1475-1493, Washington, 1898.

Doctor of Science in geography, for a thesis on the "Climatic Limits of Wheat Cultivation."[3]

The remaining universities at which geography is represented are: Manchester, Liverpool, Leeds, Sheffield, University College of Reading, Birmingham, University of Wales at Aberystwyth, Edinburgh and Glasgow. In spite of a movement started in 1884 by the Scottish Geographical Society for the establishment of a professorship at Edinburgh, the recognition of the subject by the Scotch universities is of relatively recent date, the lectureships in geography at Edinburgh and Glasgow having been founded in 1908 and 1909, respectively.

The last of the addresses on geographical instruction in Europe was that by Professor Chaix on Switzerland. Of the seven Swiss universities, Bern, Lausanne, Fribourg, and Geneva pay most attention to geography. The department at Bern has been particularly well developed by recent incumbents. In Lausanne anthropogeography is especially well represented, in Fribourg detailed topographic surveying as a basis to physiographic interpretation. In Geneva the subject is divided between the Faculties of Science and of Social Science, physical geography being taught in the former, economic geography in the latter.

The two addresses by American geographers, which could not be presented orally because of lack of time, deal with geographical instruction in the United States. Professor Brigham, in his address, first reviews the status of geography in our universities. The subject is there generally under the wing of geology, and hence physical geography, and especially physiography, are more fully developed than other phases. However, there is a widening conviction that geography is a worthy subject that should be represented in the university curriculum. Although even some of our major universities still wholly ignore the subject, there are a score or two that have been distinctly impressed by the geographical progress of the past twenty-five years. Among these may be mentioned Chicago, Yale, Harvard, Pennsylvania, Columbia, Wisconsin, Cornell, Nebraska and California. Chicago has four teachers of geography of professorial rank and offers more than twenty courses, including the principles of geography, climatology, cartography, anthropogeography and regional geography of various units. Yale offers courses in physical and commercial geography, anthropogeography and regional geography of the continents, except Australia and Africa. Aside from physiography Harvard's most geographical courses are given under climatology; there is also a course on the economic geography of South America. At the University of Pennsylvania the economic phase is emphasized, such subjects as transportation, resources, industry and commerce having the chief place. Geography at Columbia is mainly represented at Teachers College, where the pedagogical aspect of the subject is naturally given most attention. Both Wisconsin and Cornell relate their work intimately with geology but are giving increasing attention to human relations, especially in the economic field. Nebraska and California both offer a considerable range of geographical work, the latter having a distinct department of geography, not associated with the geological department. Several other colleges and universities treat geography to a limited degree, not because the subject appeals to the governing bodies or to the faculties as a whole but be-

[3] Published in the *Geogr. Journ.*, Vol. 29, 1912, pp. 347–366 and 421–426.

cause of the special interest of instructors. To these belong Northwestern, Oberlin, Denison, Syracuse, Beloit, Williams, Wesleyan, Brown and Colgate. In spite of this lesser development of geography at America, as compared with European universities, it must not be inferred that progress is small or that hope is to be too long deferred, for there is a prevailing admission that a new geography has come and that the doors of the higher schools must open to it.

After referring to the influence of the Association of American Geographers, through its professional membership, on high geographical standards in this country, Professor Brigham in conclusion makes an appeal for a wider recognition of geography because of its cultural value. That all should know geography appears in the universal recognition of it as a cardinal subject in the lower schools. And yet there are some high in educational administration who suppose it may be finished in the sixth grade and that the boy of twelve may be turned loose with all needed knowledge of the world in which he is to live and work. More than elementary training is imperative for many kinds of people. Students and teachers of history and economics, business men, journalists, members of the consular service, and public men in general—all can be benefited by geographical training. Experience shows with woeful certainty that such knowledge does not come by accident, or by unconscious daily absorption from books, newspapers and people.

Professor Jefferson, in his address, mainly traces the development of geographical instruction in our secondary schools. The interest in the geological aspect of the subject was reflected in the report of the Committee of Ten of the National Education Association in 1892.[4] It was characteristic that the committee thought physiography essential in the high schools if elementary school instruction in geography was to be saved from perishing. It thought something might be done towards this end by introducing courses in geology into the high schools until teachers could be trained in the new physical geography. The geography conference of that committee did recognize other aspects of geography than the rational explanation of land forms—calling them applied geography—but thought they ought to be taught in connection with the sciences to which they were most intimately related, as botany, or zoology, or history. Of human relations no notice was taken in the report of the Committee of Ten, but when the attempt was made to introduce physiography into the schools, the publishers, closely in touch with the schools, at once insisted on bringing "man" in to an extent that grew from year to year. The subsequent reaction of the schools on the university authors may be interestingly studied in the succession of text books for high school use that at once began to appear. Each successive book and each successive edition of each book was marked by more of "life" and "man." Taking the secondary school books on geography that have appeared since 1895 in groups of five years, the categories represented were as follows: 1895-1899, 3 physical geographies; 1900-1904, 4 physical geographies, 2 laboratory manuals and 5 commercial geographies (in the Committee of Ten's report commercial geography was not even named); 1905-1909, 4 physical geographies, 4 laboratory manuals and 1 commercial geography. In the last three years (1910-1912) there have appeared 1 physi-

[4] Cf. *Report of the Commissioner of Educatiou for 1892-93*, Vol. 2, pp. 1415-1448, Washington, 1895; specifically on geography, pp. 1430-1432.

cal geography, 2 commercial geographies and three books attempting to meet the demand for some form of geography for high schools confessedly going beyond physical geography to the activities of man as a chief object rather than as an incident. In this movement the *Journal of Geography* has been an important medium for the discussion and shaping of new policies.[5]

From this summary of the addresses presented it will be apparent that the conference was a noteworthy event in the domain of educational geography in this country. On no previous occasion, it may safely be said, has a comparison of American and European educational methods in geography been presented so forcefully and authoritatively. This comparison in itself is a source of great promise; for the exchange of ideas, the intellectual contact so felicitously established by the Transcontinental Excursion, cannot but benefit the development of geography in the United States.

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[5] On the development of geographical instruction in the United States, see also Prof. C. R. Dryer's recent paper "The New Departure in Geography," *Journ. of Geogr.*, Vol. 11, 1912-13, pp. 145-151 and 177-180. Foreign comment will be found in "Amerikanische Lehrbücher für den Geographie-Unterricht" by M. Krug(-Genthe), *Geogr. Zeitschr*, Vol. 4, 1898, pp. 274-287, and "Die Geographie in den Vereinigten Staaten" by the same, *ibid.*, Vol. 9, 1903, pp. 626-637 and 666-685; and "Geographie und Geographieunterricht in den Vereinigten Staaten von Nordamerika" by K. L. Henning, *Deutsche Rundschau für Geogr.*, Vol. 35, 1912-13, pp. 446-455 and 494-500.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Annual Meeting of the Society. The annual meeting of the Society was held at the Engineering Societies' Hall, No. 29 West 39th Street, on Tuesday, Jan. 20, 1914, at 8.30 P. M.

Vice-President Greenough in the Chair.

Report of the Council

The Annual Report of the Council was read by Vice-President Greenough:

January 15, 1914.

To the Fellows of the American Geographical Society:

In presenting their report for the year 1913 the Council take occasion to express their appreciation of the consistent interest and support afforded by all the members of the Society.

The year has been one of continuous progress and usefulness along the lines to which the Society is devoted as will appear by the details hereinafter submitted. Broadly speaking, the Society aims to afford a center of interest and sources of knowledge in all forms of geographical pursuit and to enlist a membership of students, scholars and others interested in the science. To this end its efforts embrace:

1. The maintenance of a research library of books and maps, with a convenient building for their keeping, acquisition and use.
2. The monthly publication in the Society *Bulletin* of matters of geographical progress or interest throughout the world.
3. A series of lectures by eminent speakers on current events and discoveries.
4. Correspondence and exchange of publications with all the leading organizations of a similar purpose throughout the world.
5. The award of suitable medals in recognition of distinguished achievement in geographical endeavor.
6. The encouragement and assistance of such projects of exploration and research as seem likely to add to geographical knowledge.

In pursuance of the above general scheme of activity the following summaries are presented:

The number of Fellows of the Society on December 31 was 1185, of which number 371 are Life Fellows.

The accessions to the library during the year numbered 1523 books and 5485 pamphlets, and 6731 maps. The facilities of the new building for reading and study are thought to be of the latest standard.

The ambition of the Society is to accumulate a library of research for geographical students which shall be at least equal to anything of the kind in America. Great progress has been made already and rapid advance in the future seems to be assured.

The monthly *Bulletin* published by the Society is maintained at a high level and furnishes a comprehensive record of geographical literature and endeavor throughout the world. The index to the volume and the bibliography have proved especially valuable to students.

The Society is in direct correspondence or exchange with 678 societies and governmental bureaus.

The meetings of the Society during the winter season have been increased in number by the addition of an inter-monthly meeting and have been largely attended by our members and much appreciated as instructive and interesting. Addresses have been made by Vilhjálmur Stefánsson, George B. Dexter, Albert B. Osborne, Ellsworth Huntington, Ellen Churchill Semple, Emery C. Kolb, Vahan Cardashian, Arthur Stanley Riggs, Hiram Bingham, the Rev. Hudson Stuck, Frederick I. Monsen.

The Charles P. Daly Medal was awarded to Alfred Hulse Brooks in recognition of the value of his work in the exploration and mapping of Alaska.

On March 19th, the one hundredth anniversary of the birth of David Livingstone, the Hispanic Society of America placed with our Society a fund for the endowment of a medal to be called the David Livingstone Centenary Medal, to be awarded by the American Geographical Society from time to time to persons who may distinguish themselves in the field of geographical research or achievement in the southern hemisphere. Designs for this medal are now being considered.

The Society was able to assist materially in two important exploring expeditions, one under Donald B. MacMillan in search for and exploration near Crocker Land in which the Society was associated with the American Museum of Natural History; and another directed by Professor Isaiah Bowman of Yale University for the purpose of completing a programme of work in the Central Andes supplementing previous similar exploration in the more northerly Andean region. A summary of the results of the Bowman expedition will be presented in the March number of the Society's *Bulletin*.

Arrangements have been made for the establishment of more intimate relations with the Association of American Geographers which it is hoped will be helpful to each and promote the efficiency of both. The publications of that Association will be sent to our members, and our publications will be sent to their members as issued. It is in contemplation to have, annually, a joint meeting of the two organizations by which interest in scientific geography may be promoted and encouraged. The establishment of a relation of mutual interest and service can hardly fail to be beneficial to both societies.

The Society has held in its building a number of exhibitions of photographs, maps and geographical memorabilia which have attracted a satisfactory attendance of our members and the public.

The policy was adopted of keeping the Society's building and collections open during the summer months instead of closing in the month of August as heretofore. The experiment has been a success, meeting the convenience of the staff and of the public, and this course will be pursued until further notice.

For the condition of the finances reference is respectfully made to the report of the Treasurer. Suffice it to say here that the receipts of the year from dues, interest and donations equalled the expenditure, and the invested fund remains unchanged.

In conclusion the Council feels justified in the opinion that never before was the Society in as good condition as at present for fulfilling the objects for which it exists. All the members of its working staff have performed their duties with zeal and efficiency and constant evidences of recognition are received from outside observers as well as from members of the Council.

JOHN GREENOUGH,
Chairman of the Council.

PAUL TUCKERMAN,
Secretary.

Report of the Treasurer

In the absence of the Treasurer, Henry Parish, Jr., his report for the year 1913 was read by Mr. Chandler Robbins as follows:

General Account

The Treasurer respectfully reports:

On January 1st, 1913, there was on hand a balance of (of which was accumulation of uninvested Capital $1,250).		$3,077.02
During the year there have been received for Fellowship Dues, Sales of Publications, Interest on Investments and Donations	$49,179.29	
A legacy from the Estate of Francis M. Bacon........	1,000.00	50,179.29
Total		$53,256.31

There have been expended for Salaries, Meetings, Library, Publications, House Expenses, Insurance, Postage, &c.	42,445.40	
For exploration	7,000.00	
Reinvested at interest	1,250.00	50,695.40
Leaving a balance on hand Dec. 31, 1913		$2,560.91

$1,000 of which is Capital awaiting investment.

Report of the Nominating Committee

The Special Committee appointed November 20, 1913, to nominate and invite suitable persons to fill vacancies which will occur in the offices of the Society at the date of its annual meeting in January, 1914, respectfully report that they recommend the election of the following gentlemen to the offices designated:

		For term expiring
Vice-President	JOHN GREENOUGH	1917
Domestic Corresponding Secretary	ARCHIBALD D. RUSSELL	1917
Treasurer	HENRY PARISH, JR.	1915
Councillors	JAMES B. FORD OTTO H. KAHN GRENVILLE KANE CHARLES H. TWEED MADISON GRANT	1917

[SIGNED] CHANDLER ROBBINS,
L. HOLBROOK,
PAUL TUCKERMAN, *Committee.*

The vote of the Society was unanimously in favor of the persons recommended by the Council and they were declared duly elected.

Mr. William Churchill Elected Corresponding Member

On the recommendation of the Council, the Society elected Mr. William Churchill, of New York City, Corresponding Member. Mr. Churchill has written many monographs on ethnological and philological topics and has for some years contributed to the general and critical departments of the Society's *Bulletin*.

The following persons, recommended by the Council, were elected to Fellowship:

Florentino Telles de Menezes of Aracaju, Brazil,
Albert Bushnell Hart, Cambridge, Mass.
Charles R. Keyes, Des Moines, Iowa, and of this city,
Algernon T. Burr,
C. S. Hammond,
John Addams Linn,
T. Gilbert Pearson,
Lynde Selden.

At the conclusion of the business session, Frederic Dean, A.M. LL.B., addressed the Society on "Porto Rico, Our West Indian Outpost." He gave a vivid impression of the great population, resources and attractions of the island. Many lantern views were shown.

A regular meeting of the Society was also held on Tuesday evening, December 23, 1913, at the Engineering Societies' Hall. Vice-President Greenough in the Chair. The following persons, 16 in all, recommended by the Council, were elected to Fellowship:

John Dunbar Adams,
Henry B. Adriance,
Robert Low Bacon,
Edward P. Beckwith,
Douglas W. Dunn,
F. Herbert Filley,
R. Jay Flick,
Arthur R. Gray,
Edward Stuart Hale,
Miss Ida H. Ogilvie,
Solomon G. Rosenbaum,
George J. Sager,
Louis E. Schwab,
Edward Elwell Spafford,
Arthur Clifford Veatch,
Philipp W. Zellenka.

Mr. Frederick I. Monsen then addressed the Society on "Mexico and Her People," with lantern illustrations.

The Index for 1913. The index to Volume XLV of the *Bulletin* is now being printed and will be sent to our Fellows and exchanges as soon as it is off the press. Covering more than 100 pages, it embraces the important geographical literature and map products of the past year. So useful an aid to geographers and to those interested in any phase of geographical study should be accessible in the public libraries and a part of the reference material of all workers in our field. A limited number of copies will be on sale at the office of this Society. Price 50 cents postpaid.

The late Townsend Harris. The Society is informed by Mr. William Elliot Griffis, the lecturer and author, that the book, "Townsend Harris, First American Envoy in Japan," has been translated into Japanese and issued in an attractive volume, which sells in Japan at sixty-five cents in our money, and is therefore calculated for general reading. Mr. Harris was, at one time, President of the Board of Education in New York City. He was elected a Fellow of the American Geographical Society in 1868 and became Foreign Corresponding Secretary of the Council in 1870.

NORTH AMERICA

Association of American Geographers. The Tenth Annual Meeting of the Association was held at Princeton on January 1 and 2, 1914. About thirty-five members were present and the attendance of members and non-members ranged from twenty-five to sixty. Thirty-six titles appeared in the programme and twenty-eight were read. It was one of the most enjoyable meetings the Association has held.

The officers nominated for 1914 were elected and the full Council for the year is as follows:

President, Albert Perry Brigham; First Vice-President, Charles R. Dryer; Second Vice-President, C. F. Marbut; Secretary, Isaiah Bowman; Treasurer, François E. Matthes; Editor, Richard E. Dodge.

Councillors: Lawrence Martin, Robert DeC. Ward, Alfred H. Brooks.

The nominating committee for officers for 1915 consists of C. F. Marbut, Chairman, R. H. Whitbeck, H. H. Barrows.

In his report on the meeting Secretary Bowman says:

"The Round-Table Conference, conducted by Alfred H. Brooks, was one of the most successful ever held by the Association. A remarkable degree of unanimity was shown concerning not only the plan of cooperation between the Association and the American Geographical Society, but also concerning the best means for promoting geographical research. It was the general opinion of the members that the proposed plan would tend toward a better organization of effort and a higher standard of scholarship. That part of the plan relating to a joint meeting in New York with the American Geographical Society had a most cordial reception; about four-fifths of the members present agreed to attend the first joint meeting."

At a business meeting on January 2, the plan of cooperation between the Association and the American Geographical Society was unanimously adopted. In carrying out the provision relating to the administration of a joint research fund the Council appointed the following research committee:

Alfred H. Brooks, Chairman (term expires December, 1917); Herbert E. Gregory (term expires December, 1916); Robert DeC. Ward (term expires December, 1915).

The next annual meeting will be held west of Pittsburgh at some place not yet decided upon.

The following papers were read:

H. G. Bryant (President's Address.) Government Agencies and Geography in the United States.

R. H. Whitbeck. A Geographical Study of Nova Scotia.

W. M. Davis. The Mission Range, Montana.

J. Russell Smith. The Tree as a Factor in Man's Adjustment to the Arid Environment.

R. DeC. Ward. The Weather Element in American Climate.

Howard Palmer (Introduced by W. L. G. Joerg). Glacial Features of the Selkirks.

Oliver L. Fassig. The Frostless Period in Maryland and Delaware.

Roy C. Andrews (Introduced by Ellsworth Huntington). Exploration in Northern Korea.

Leon Dominian. Geographical Influences in the Delimitation of Spheres of Foreign Interests in Asia Minor.

Lawrence Martin. Glaciers and International Boundaries.

F. E. Matthes. Lessons in Glacial Erosion from the Yosemite Region.

Robert M. Brown. The Effects of Levees on the Height of River Beds.

N. M. Fenneman. Definition and Boundaries of Physiographic Provinces in the United States.

Mark Jefferson. The Growth of American Cities.

W. L. G. Joerg. The Subdivision of North America into Natural Regions.

O. E. Baker (Introduced by C. F. Marbut). A Proposed Atlas of American Agriculture.

Frank M. Chapman (Introduced by Ellsworth Huntington). The Distribution of Life in Colombia.

Charles F. Brooks (Introduced by R. DeC. Ward). The Snowfall About the Great Lakes.

William Libbey. A Subject Catalogue of Geographical Periodicals.

Roland M. Harper. The Coniferous Forests of Eastern North America.

Richard E. Dodge. Geography Teaching in Normal Schools.

C. J. Kullmer (Introduced by Ellsworth Huntington). Storm Frequency in the United States and Europe.

Henryk Arctowski. The Pleionian Variations of Temperature: The Brachypleions of Arequipa: Macropleionian Variations in the United States.

Ellsworth Huntington. Climate and Human Efficiency.

R. H. Whitbeck. Some Economic Aspects of Glaciation in Wisconsin.

Frank Carney. A Study of the Programs of this Association, 1904. 1912.

Isaiah Bowman. The First Decade.

Alfred H. Brooks. Round-Table Conference.

Derivation and Probable Place of Origin of the North American Indian. In a paper with this title read by Dr. Aleš Hrdlička at the International Congress of Americanists, London, 1912 (*Proceedings of the 18th Session*, London, 1913) he summarizes his conclusions as follows: "The American natives represent in the main a single stem or strain of people, one homotype; this stem is identical with that of the yellow-brown races of Asia and Polynesia; and the main immigration of the Americans has taken place, in the main at least, gradually and by the northeastern route in the earlier part of the recent period, after man had reached a relatively high stage of physical development and multiple secondary differentiations. The immigration, in all probability, was a dribbling and prolonged overflow, likely due to pressure from behind or want, and a search for better hunting and fishing grounds in the direction where no resistance of man as yet existed. This was followed by multiplication, spread, and numerous minor differentiations of the people on the new, vast, and environmentally highly varied continent, by rapid differentiation of language due to isolation and other natural conditions, and by the development, on the basis of what was transported, of more or less localized American cultures. It is also probable that the western coast of America, within the last 2,000 years, was on more than one occasion reached by small parties of Polynesians, and that the eastern coast was similarly reached by small groups of whites, and that such parties may have locally influenced the culture of the Americans; but such accretions have nowhere, as far as we know to-day, modified the native population."

Improving Yosemite Park. Secretary Lane of the Interior Department, Washington, according to *American Forestry* (Vol. 19, 1913, No. 12, p. 951), has appointed an Advisory Commission looking to the improvement of the Yosemite National Park, Cal. The Commission, which consists of Ex-Mayor James D. Phelan of San Francisco, Mr. Noah Daniels, landscape gardener, Mr. Leslie Symmes, Civil Engineer, and Major W. T. Littlebrant, acting superintendent of the park, will advise with the Secretary in matters relating to the park, its improvement, its accessibility to tourists, etc.

Return of the "Carnegie." The magnetic survey vessel *Carnegie* has returned to Brooklyn, thus completing the circumnavigation cruise begun

in June, 1910, and covering a distance of over 70,000 miles. The vessel has been throughout under the command of W. J. Peters, and her work has been to determine the magnetic elements at sea in fulfillment of the plan of a general magnetic survey of the globe under the direction of the Department of Terrestrial Magnetism of the Carnegie Instituion of Washington. (*Science,* No. 991, Vol. 38, 1913, p. 922).

Ohio Valley Flood of 1913. An official report of the Ohio Valley Flood of March-April, 1913, has been issued by the U. S. Geological Survey (The Ohio Valley Flood of March-April, 1913. A. H. Horton and H. J. Jackson. *Water Supply Paper 334,* Washington, 1913). The pamphlet contains a good summary of the events preceding, during and subsequent to the flood but its contribution is mainly in the tabulated reports from a large number of stations over the entire flooded area and in the hydrographs of many localities along various streams. In order that the reader may make comparisons, the authors have included full accounts of the 1907 and the 1884 floods in the districts, and have tabulated the data of all floods since 1859. Some attempt is made to estimate the damage done by the 1913 flood. In 206 towns there was a loss of 415 lives, 60,043 buildings were flooded, 419 bridges destroyed and the property loss amounted to over $180,000,000. This is actual damage and does not include losses due to suspension of business, decreased confidence and general depression. The report considers the possibility of a flood on the Ohio in conjunction with floods on the upper Mississippi and the Missouri and urges the government, in the face of this possibility, to establish a complete system of river control. ROBERT M. BROWN.

The Yukon River. The late Mr. William Ogilvie in his book "Early Days on the Yukon," just published, has these general remarks on the Yukon:

"The Yukon River is unique among rivers, in that it rises within fifteen miles of tidal waters in the Dyea Inlet on the Pacific coast, whence it flows in a north-westerly direction nearly 1,000 miles, just crossing the Arctic Circle, where it turns south-west through the middle of Alaska, and then flows more than 1,200 miles until it reaches the ocean within sight of which it rose; for we may properly call Bering Sea a part of the Pacific Ocean. This grand stream is also surprising in the length of navigation it gives in proportion to its total length, for less than fifteen miles north from where its tiniest streamlets trickle from the summit of Dyea Pass lies Lake Bennett, whose head is the beginning of steamboat navigation on this noble stream. From the starting-point of those same streamlets one can look down on other streamlets beginning their steep descent of the Dyea Pass to the waters of the wide Pacific, only as far away on the south as Bennett is on the north.

"From the head of Lake Bennett to Bering Sea is about 2,500 miles by the course of the river, and all this length, with the exception of three and a half miles at the Cañon and Rapids, is navigable; thus all its length, except the first fifteen steep miles down the slope of its source and the three and a half at the Cañon, is navigable. Can this be said of any other river in the world?"

Progress of the Grand Trunk Pacific. The main line of the Grand Trunk Pacific has now been completed to 303 miles east of Prince Rupert, B. C., and trains are in operation as far as mile 301 Rose Lake. Steel has been laid to mile 1240 west of Winnipeg, or 145 miles west of Tête Jaune. Trains are now running daily to Second Crossing of the Fraser River at mile 1190 west of Winnipeg.

Altitude and Population of Mexican Cities. A list of the more important cities of Mexico and their elevation above sea level has been compiled by Dr. E. Wittich (*Memorias y Rivista de la Sociedad "Antonio Alzate,"* Vol. 31, p. 337, 1912). The three cities in Mexico with a population over 100,000 inhabitants are the City of Mexico, population 470,659, altitude 7,421 feet; Guadalajara, population 118,799, altitude 5,118 feet and Puebla, population 101,244, altitude 7,093 feet. Of the twenty-two cities whose population ranges between 100,000 and 20,000, fourteen lie at an altitude exceeding 4,921 feet and only four are below 3,937 feet. Out of a list of twenty-seven cities ranging between 10,000 and 20,000 inhabitants, thirteen are built at elevations over 3,280 feet.

Of fifty-two cities having a population of over 10,000, twelve are situated

at an altitude above 2,000 meters (6561.80 feet), while thirty-four lie above 3,280 feet. The aggregate population of these thirty-four cities is approximately 1,750,000; while the remaining cities lying below 3,280 feet have a total population of about 350,000.

The highest Mexican town is the mining town of Real del Monte in the State of Hidalgo. Its population is 10,008, its altitude 8,927 feet. Toluca comes next at 8,819 feet, population 31,247. Zacatecas, population 25,905, follows at an altitude of 8,169 feet. Then come Pachuca, population 38,620, altitude 8,025 feet; Mixcoac, population 13,285, elevation 7,792 feet; Tacubaya, population 35,830, elevation 7,622 feet; and Guanajuato, population 35,147, elevation 6,706 feet.

CENTRAL AMERICA AND WEST INDIES

Population of Costa Rica. Vol. XVI of "The Annuario Estadistico" of the Republic of Costa Rica contains a report of the chief of the Demographic Section in which the population of the republic is given as 399,424 on Dec. 31, 1912. The distribution of population among the provinces is: San José 124,109, Alajuela 95,382, Cartago 61,439, Heredia 43,304, Guanácaste 34,952, Puntarenas 20,591, Limon 19,647.

SOUTH AMERICA

Standard Time Adopted in Brazil. The American Ambassador at Rio de Janeiro reports that standard time referred to the meridian of Greenwich has been adopted in Brazil and became effective on January 1, 1914. The Republic has been divided into four standard time zones. The first zone includes the archipelago of Fernando Noronha and the Island of Trinidad in which the standard time is two hours earlier than that of Greenwich. The second zone includes the whole sea coast of Brazil and in this zone the standard time is three hours earlier than at Greenwich. Two other zones in which the time is four and five hours earlier than at Greenwich cover the interior and western portions of the country. (*Hydrogr. Bull.*, Jan. 7, 1914, Washington, D. C.)

AFRICA

Change of Climate in East Africa. In his account of the interior basin region of northern German East Africa (Das Hochland der Riesenkrater, Teil II, Kapitel 16, p. 179) Dr. Fritz Jaeger cites various facts leading to the conclusion that a moister climate prevailed in the recent past. The difference may have been due to greater rainfall or to lower temperature and diminished evaporation. The greater mountains, such as Kilimanjaro and Ruwenzori, show by their moraines that the glaciers formerly descended much lower than now. Very many observations show that the lakes of the regions were once at higher stands. Several examples are cited and other observers are quoted. In various places, boulders appear at such heights above valley bottoms that they could not have been deposited under present conditions. Gorge-making has taken place on mountain slopes where water scarcely flows at the present time. The origin of some alluvial gravels also betokens moister climate, as in places where the clays were deposited in swamps, while to-day grass steppes occupy the valley bottoms. Further evidence is found in the distribution of plant life. Isolated patches of forest in East Africa show strong relationship with the forests of Central and West Africa and are believed to be remnants of a more widely distributed forest flora. Of the same meaning is the similarity of high mountain floras in widely separated localities. While conceding that some of the suggested evidence may call for further investigation, the author regards the phenomena of the moraines, the lake beaches and the distribution of plants, as fully conclusive. A. P. Brigham.

ASIA

Settlement of the Turco-Persian Boundary Contest. The signing of the Constantinople protocol of November 17, 1913, by the Grand Vizir and the ambassadors of Great Britain, Russia and Persia ended the controversy between the Turkish and Persian governments regarding their boundary line.

According to *Asie Française* (November, 1913, p. 488), the contested zones of Bariga, Torgever, Desht, Morgever, Vahuu and Zerivan, all in the northern section of the boundary zone are definitely assigned to Persia. At the southern end of the frontier, the waters of Shott-el-Arab with most of their islands remain under Turkish sovereignty. Persia acquires Muhalla and six of its island administrative dependencies. Persian jurisdiction over Mohammerah is confirmed without reservations. A commission consisting of British, Russian, Turkish and Persian delegates will start early in 1914 to survey the region. It is expected that the work will require at least eighteen months. The Russian and British commissioners are to act as umpires in the event of any divergence arising between the Turkish and Persian representatives.

The Languages of Borneo. The interest of the Rajah of Sarawak in the affairs of his dominion, has provided the funds whereby the Sarawak Museum has been enabled to begin the publication of its journal. The fourth number of that publication preserves for the students of the life of central Indonesia a very considerable record of speech in "The Languages of Borneo" by Sidney H. Ray. This valuable volume is so arranged as to coordinate with Mr. Ray's great report on the philology of the Cambridge expedition to Torres Straits, the vocabulary containing the same elements and in the same order. Linguistic science has recently become particularly interested in the obscurer languages of this area because of the immediate promise that they provide an approach to a new philology of primitive speech. Mr. Ray's contributions of such data will do good service in their presentation of necessary material.

WILLIAM CHURCHILL.

POLAR

ANTARCTIC

Exploration of King Edward VII Land. Mr. J. Foster Stackhouse is endeavoring to organize an expedition with the object of charting the coast of King Edward VII Land. It is proposed to leave England in August, 1914, and proceeding south by way of the Falkland Islands, to enter the ice in about 70° S., 100° W. It is hoped that this position will be reached by the end of December, and the vessel will proceed as far south as possible while the summer lasts. If it be practicable to make the land, Mr. Stackhouse proposes to winter in some convenient harbor; otherwise it will be necessary to winter in the pack and proceed to the west during the following summer, before the end of which it is hoped that the homeward voyage will be begun. If necessary, however, Mr. Stackhouse proposes to spend a second winter in the ice, and do further work during the following summer. It is stated that a strong staff of scientists will be carried and the vessel selected fully equipped for scientific research. The total cost of the expedition is estimated at £40,000. (*Geogr. Journ.*, Vol. 42, 1913, No. 6, p. 575.)

ARCTIC

By Sea to the Yenisei River. Captain Joseph Wiggins proved, in 1875, the possibility of opening a commercial sea route from the Atlantic and through the Kara Sea to the Yenisei River, Siberia. Last year a company, backed by British, Russian and Norwegian capital and managed by Dr. Jonas Lied of Norway, chartered the steamship *Correct*, sent her with a mixed cargo to Siberia through the Kara Sea and brought home a cargo of Siberian produce which was discharged at London. Dr. Nansen made this journey to the Yenisei. In a lecture before the Imperial Geographical Society of St. Petersburg, he endorsed Captain Wiggins and his followers as to the possibilities of the route but added that more than one voyage during the season should not be undertaken until we know more about the ice conditions in the Kara Sea. Although navigation is nominally practicable during July, August and September there seems to be no certainty of getting through the ice except towards the end of the period. He approved of the wireless stations that have been opened at the straits leading into the Kara Sea and on the Yamal Peninsula but believed that a fourth wireless station should be established at Dickson Harbor at the mouth of the Yenisei. He advised the Russian Government to

explore the Kara Sea in all directions during the season of navigation by means of a small fleet of motor sailing vessels which should report by wireless to the radio stations the exact conditions in different parts of the sea. He also advised that aeroplanes be used in connection with the radio stations to explore the surrounding waters.

The Russian Government has decided to create a regular pilot service, to develop the wireless stations and to supplement them by aeroplane and other auxiliary services as recommended by Dr. Nansen. A subsidy will be paid for five years to the firm that sends in the most satisfactory proposal for the establishment of regular steamship traffic between a port on the Baltic and the mouths of the Ob and the Yenisei calling at Hamburg, London and other ports. The line must be run under a Russian flag and preferential rates given to Russian goods. (Condensed from the *London Times,* Russian Supplement, Dec. 15, 1913, p. 11.)

PERSONAL

Professor Cleveland Abbe, the distinguished meteorologist of the U. S. Weather Bureau, celebrated his 75th birthday on Dec. 4.

Professor Charles R. Dryer has retired from the chair of Geography and Geology in the Indiana State Normal School at Terre Haute after twenty years service. He has changed his domicile to Oak Knoll, Fort Wayne, Ind., but is spending a part of the winter in New York. His successor at Terre Haute is Bernard H. Schockel, M.A., late of Chicago University, who will be glad to receive any communications relating to his department.

Professor Douglas W. Johnson of Columbia University lectured before the American Scenic and Historic Preservation Society at the American Museum of Natural History, Jan. 14, on "The Scenery of the Atlantic Coast and Its Answer to the Question: Is the Coast Sinking?" Colored lantern views of all parts of the coast were shown.

GENERAL

Atlas to Illustrate the Forms of Terrestrial Relief. The preparation of this atlas was approved at the Ninth International Geographical Congress in Geneva. A committee was appointed which evolved a plan for carrying it out, found a publisher and also obtained pecuniary aid to produce a specimen number and distribute it among scientific bodies.

At the Tenth Congress in Rome, March 27-April 3, 1913, Professor Émile Chaix of Geneva said that possibly the first series of from forty-five to forty-seven plates would be in the hands of subscribers by the end of 1914. General Schokalsky moved: "The Tenth International Geographical Congress approves of the plan adopted for carrying out the project and the execution of the work so far as it is yet done. It strongly recommends all geographers and all scientific institutions to aid this enterprise in every possible way." The resolution was adopted and was confirmed at the final meeting of the Congress.

The Society has received a letter from Marquis Cappelli, President of the Congress, requesting the geographers of all countries to give every aid in their power to the carrying out of this important work. He bespeaks the suggestions and assistance of geographers and geographical societies.

Warning Ships on their Approach to Icebergs. Before the *Titanic* disaster Prof. H. T. Barnes of McGill University was at work on the problem of warning ships of their approach to icebergs ("Icebergs and Their Location in Navigation," *Annual Report Smithsonian Institution, 1912,* pp. 717-740, Washington, 1913). By his invention of the microthermometer, a self-recording thermometer which measures temperature changes of a tenth of a degree, Barnes has shown definitely that the temperature *rises* as icebergs are approached though it falls rapidly in the immediate neighborhood of the bergs. This has been tested in detailed experiments in the Straits of Belle Isle, in a voyage from the St. Lawrence to Hudson Bay, and in several trips across the Atlantic Ocean. Icebergs eight to twelve miles from the ship affect the microthermometer notably, and within a quarter mile of the berg the rise of temperature is very sharp indeed. LAWRENCE MARTIN.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

The Trail of Lewis and Clark, 1804–1904. A story of the great exploration across the continent in 1804-06; with a description of the old trail, based upon actual travel over it, and of the changes found a century later. By Olin D. Wheeler. Vol. 1: xxiii and 377 pp. Vol. 2: xv and 419 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1904. $4 a set. 8½ x 6.

This work is and will be very useful. It is a well illustrated account of the Lewis and Clark expedition with copious extracts from their journals, explanations of parts of the original narrative, descriptions of the present aspects of the vast region through which the pioneers blazed a way, accounts of the later fortunes of Indian tribes first revealed in the epic story; and it gives, besides, probably the best solution that will be reached of problems relating to the exact routes followed at certain stages of the journey.

The story of this greatest of North American explorations teems with interest; and this book with the side-lights that the author's long studies enable him to throw upon the enterprise may be commended as a reliable and complete account of it.

American Irrigation Farming. A systematic and practical treatment of every phase of irrigation farming, including its history, with statistical tables and formulas. By W. H. Olin. 364 pp. Ills., index. A. C. McClurg & Co., Chicago, 1913. $1.50. 8 x 5.

Mr. Olin who has studied irrigation farming problems for the past ten years throughout the entire irrigated area of Colorado, Wyoming, and Idaho, says that the total cost per acre of growing potatoes under irrigation is $38.50 and one irrigated district of 3,000 acres of potatoes is producing better than 300 bushels per acre. This is only one instance in many. Other crops pay proportionately as well, and it is with the purpose of showing the novice as well as the seasoned farmer how these large yields may be obtained, that the book is written.

Starting with a history of irrigation and an explanation of its fundamental terms, the author next considers the various types of soils; the habits of plants in arid regions; preparation of the seed bed; methods of levelling the ground for effective irrigation; detailed directions for planting, caring for, and harvesting those crops best suited to irrigation; best rotation of crops; in short, everything which is required for a thorough and practical understanding of farming by irrigation. The volume concludes with statistics and working tables. WILBUR GREELEY BURROUGHS.

The Climate and Weather of San Diego, California. By Ford A. Carpenter. xii and 118 pp. Charts, ills., index. San Diego Chamber of Commerce, 1913. 7 x 5.

Mr. Ford A. Carpenter was for sixteen years Local Forecaster at San Diego. He evidently writes *con amore.* A more charming account of local climate we have never seen. There is a charm of style and an attractiveness of presentation which cannot help leaving the reader who has never been in San Diego with a strong desire to take the first train for that favored spot. That the

author loves San Diego and every phase of its climate and weather is obvious on every page. He even speaks of the "desirable features" of the desert wind, and of the "beneficial effects" of the famous coast fogs. There are some unusually good cloud pictures, several of which give an excellent idea of the general situation of the city. So up to date is the little volume that the famous January "freeze" of the present year is mentioned. On this occasion the San Diego record of not having had a minimum temperature below 32° within the period of observation was broken. The minimum in January, 1913, was 25°. The book is published by the San Diego Chamber of Commerce, and is therefore pretty clearly intended for advertising purposes. But there is little or no undue exaggeration in it. Mr. Carpenter is to be congratulated upon having written so delightful an account, and so complete a one, of San Diego's weather and climate. We wish there might be more like it for other places. R. DEC. WARD.

Animal Communities in Temperate America as Illustrated in the Chicago Region. A Study in Animal Ecology. By Victor E. Shelford. xiii and 362 pp. Map, ills., index. *Geographic Society of Chicago Bull. No. 5.* Univ. of Chicago Press, 1913. $3.22. 10 x 7.

This study in animal ecology is based upon material accumulated during ten years of field study. The material was collected in the area about Chicago—an area some 80 miles wide and 134 miles long.

The general principles of animal ecology are discussed in the first six chapters. The opening chapters deal with man's relations to nature,—especially to animals. This includes both the economic relations of animals to man as well as the influence of man on animals.

The following two chapters deal with the relations of animals to their environment together with the different types of environments. The author mentions the most important factors of the environment as being "water, atmospheric moisture, light, temperature, pressure, oxygen, carbon dioxide, nitrogen, food, enemies, materials used in abodes, etc. In nature the combinations of these in proportions requisite for the abode of a considerable number of animals are called "environmental complexes." The author states it as his purpose to consider animals as inhabiting environmental complexes, rather than to isolate their responses to various single factors. He further calls attention to the distinction between "local" and "climatic" environmental complexes. Those environments coming under the head of climatic, are such as climate proper, and such features as types of vegetation of any considerable extent, as "steppe," "deciduous forests," etc. Local environments lie within the climatic, as for example, such local conditions as ponds, lakes, streams, soils, exposure, etc. It will be observed that these are geographical in nature.

The Chicago area is represented by two geographical environmental complexes,—the savanna, and the deciduous forest,—badly broken up by many local complexes.

The author now considers the various communities of ponds, lakes, streams, swamps, forests, thickets, prairie, etc., from the standpoint of reactions to their environments. Tabulated lists of animal data are given at the ends of each of these chapters. These include the common and scientific names of the animals found, the habitat from which collected, and the particular local environment. These habitat records are very exhaustive and include the names and environments of nearly 1,000 species of animals.

There are over 300 splendid animal figures and several maps and diagrams, thus making the volume of great value not alone to teachers and collectors, but also to students of geographical distribution.

This excellent bit of pioneer work concludes with a chapter on a general discussion of (a) the relations of different communities to one another, (b) the laws governing distribution, (c) a discussion of the relations of ecology to broader geographical problems. This latter discussion is especially interesting and suggestive. He says "the relations of ecology to human geography are especially intimate. The parallelism between the geographical phenomena in animals and the relations of culture to environment lie not in color and structural adaptations of animals, but in the *behavior-characters* of

animals which enable them to live under a given set of conditions, and the *behavior* which those conditions produce. Finally, animal ecology offers the material and methods with which many ideas of geography may be experimentally verified.

This book is unique in that it is a pioneer of its sort and the first serious attempt to treat of the physiology of organisms and of animal communities in such shape as to serve as an adequate text and reference work for students. There is an adequate bibliography of 214 references, as well as author and subject indices. R. W. SHARPE.

Geology of the Columbus Quadrangle. By Clinton R. Stauffer, George D. Hubbard and J. A. Bownocker. viii and 133 pp. Maps, ills., index. Bull. 14, 4th Series, Geol. Surv. of Ohio. Columbus, Ohio, 1911. 9½ x 6½.

Part I, Historical Geology, was prepared by Dr. Stauffer; Part II, Physiography and Surficial Geology, by Prof. Hubbard, and Part III, Economic Geology, by the State Geologist. Part II is the longest of the sections. The report is designed primarily for the use of school and college students and teachers. The authors doubtless had in mind the service which such a report might be to classes in the state university.

In Part II, Prof. Hubbard describes and interprets the present general topography, and gives an account of the pre-Wisconsin, the Wisconsin and the post-Wisconsin changes in topography. He finds satisfactory evidence of two glacial epochs, widely separated in time, but is not sure of more than two. Buried valleys are numerous; at least thirty-two, crossed by present streams, are noted. The many moraines of the area and their attendant features are described in considerable detail. The relatively small area mapped makes possible an amount of detail not usually found in state reports. The volume constitutes an excellent field manual, and the painstaking quality of the work, the three maps in the pocket, and the exceptionally good plates, all reflect credit upon the authors. R. H. WHITBECK.

AFRICA

Camera Adventures in the African Wilds. Being an Account of a Four Months' Expedition in British East Africa, for the Purpose of Securing Photographs of the Game from Life. By A. Radclyffe Dugmore. xix and 233 pp. Ills. Doubleday, Page & Co., New York, 1910. $6. 11 x 8½.

Noteworthy both for its remarkable photographs and its informing letterpress. The author was once an enthusiastic Nimrod but in recent years he has found far greater pleasure in hunting with the camera. He has to-day an international reputation for the superiority of his photographs of animals, nearly all of them taken in the open and, in many cases, when the subject of the picture was too near the camera for the comfort of nervous photographers. A large number of these photographic reproductions appear in this book without retouching or other improvement. The book is thus a vivid record of the most conspicuous animal life of British East Africa and as such will be more valuable as time goes on for the wild life that has added so much to the repute of this part of Africa is destined largely to disappear as the land becomes more and more devoted to the service of man. The pictures also show many phases of the native life. The textual information, in point of interesting and informing quality, is worthy of the pictures.

The Fetish Folk of West Africa. By Robert H. Milligan. 328 pp. Ills. Fleming H. Revell Co., New York, 1912. $1.50. 8½ x 6.

It is seldom that records of missionary service are reliable material for social and ethnological study, but the readers of this delightful volume on the Fetish Folk of West Africa will quickly recognize an exception. The warp and woof of the book is a survey of the life, habits, and social customs of the

Mponge and Fang tribes of the French Congo, with especial reference to the fetishism which the writer defines as belief in the residence of spirits in certain objects of nature. Broadly speaking, these objects fall into three classes in an ascending scale, the charm, the fetish proper, and the relic, chief of which is the ancestral skull. Whatever its exact nature, belief in it is the controlling *motif* of the people among whom it is found.

In tracing the moral and mental results of fetishism Mr. Milligan makes an analysis of the West African character which is sympathetic and illuminating. Against this as background is thrown the story of a missionary's adventures on the coast and in the interior, of his journeys in the steam yacht *Dorothy*, of the establishing of a boy's school, and lastly, of the results of Christianity as an instrument of social and moral progress. Altogether the volume is one of much merit and vivid interest. HELEN S. OGDEN.

Études Bakango (Notes de Sociologie Coloniale.) Par A. de Calonne Beaufaict. 152 pp. Ills. Mathieu Thone, Liège, 1912. 10 x 7½.

It is pleasant to find in the Belgian administration of the Congo such unmistakable evidence of sympathy with cultural childhood as this work offers. M. de Calonne in these pages deals with a riverine folk whose terrain is no more than a ribbon, a single kilometer in width and 400 in length along the banks and islands of the Welle, between the rapids of Mokwangu and Panga. He sketches their progress in such arts as they need and supplies the beginning of a vocabulary of their speech which they denominate Likango. But the chief theme of the volume is his careful and brilliant discussion of the development of this negro state. They are a folk of but a single industry, their life depends on the fish of the river, and their culture has evolved wholly from the needs of the angler and from the advantages over their neighbors which the art of fishing has given to the Bakango. We are, of course, familiar with the specialization of particular industries within the community in operative classes or castes; this is a wholly new condition to which we are introduced in the study of a race devoted to a single industry and cutting through a succession of other race-communities through their command of the waterway, an interesting parallel with our ancient common law that a charge of trespass might not lie against any one who came by water. He examines with skill the evolution of the social unit, in its origin a patriarchal unit of polygamy but always subject to scission whenever it becomes unwieldy. In a clever computation of the goods of the community unit he states in terms of accountancy that the total fixed capital to assure the livelihood of seven adults and a considerable number of dependent children does not exceed in canoe and nets and all furnishings so minimum a sum as $20.

WILLIAM CHURCHILL.

La Tripolitaine Interdite. Ghadamès Par Léon Pervinquière. 254 pp. Maps, ills. Hachette et Cie, Paris, 1912. Fr. 5.50. 7½ x 5.

The famous Saharan town of Ghadamès is now in the Italian domain of Libya as a result of the Italian-Turkish war. This book shows Ghadamès* as it is to-day. Pervinquière gives a sketch of its history, still little-known though it is probable that the town antedated the Roman conquest. The distinctive features of the book are that the author tells so much of the town and its people and adorns his narrative with so many photographs. Considering that he employed his camera only under the greatest difficulties he met with surprising success. He shows us in picture and text the somber, roofed streets, groups of the people and the wonderful lake fed from sources of artesian depth that ages ago turned this little area into a garden amid the aridity of its surroundings. The book is the latest and one of the best descriptions of the Ghadamès oasis which comprises only a little over 200 acres, is the home of some 3,000 souls and contains about 25,000 palm trees. It was most flourishing commercially before the recent decline of the Saharan trade between the Mediterranean States and the Sudan which cut off most of its carrying trade.

*** Rohlfs wrote that Rhadames was the more accurate transliteration and his spelling is also in use.**

L'Eritrea Economica. Conferenze di Ferdinando Martini, O. Marinelli and others. xiv and 542 pp. Maps, ills. Biblioteca Geogr. dell'Inst. Geogr. de Agostini, No. 1. Novara-Roma, 1913. L. 16. 10 x 7.

Fifteen specialists have contributed as many chapters (originally prepared as lectures), each dealing chiefly with the more important economic problems pertaining to the region. The book is therefore particularly free from weak parts which are often noticeable whenever a single author attempts to prepare a compilation of this nature. Its only defect lies in the lack of a recapitulation in which résumés of each chapter should have been correlated in a comprehensive survey. This task is left to the reader.

Promise of future Eritrean prosperity in agriculture and stock-raising is revealed. Indications of mineral wealth are likewise recorded. There is some tendency towards exaggerated optimism but, on the whole, the chapters are characterized by great accuracy of data. The book is the first of a series which bids fair to be valuable. The publishers have given proof in recent years of the excellence of their geographical publications. LEON DOMINIAN.

Vom Kongo zum Niger und Nil. Berichte der deutschen Zentralafrika-Expedition 1910-1911. Von Adolf Friedrich Herzog zu Mecklenburg. Vol. 1: x and 324 pp. Vol. 2: x and 398 pp. Maps, ills., index. F. A. Brockhaus, Leipzig, 1912. Mk. 20. 9½ x 6½ each.

This second expedition to Central Africa by the Duke of Mecklenburg has thrown light on some of the darkest parts of the continent. Although the original project of crossing the whole width of the continent could not be carried out owing to adverse political conditions in French Wadai, the expedition covered considerable ground by dividing itself into branch expeditions whose combined routes amount to 8,078 miles of travel. Starting at the mouth of the Congo the main expedition went to Kinshassa on Stanley Pool, where the botanist Dr. Mildbraed and the entomologist Dr. Schultze were detached for a trip into southern Kamerun. The rest of the main party proceeded up the Congo and Shari rivers to Lake Chad, remaining there some time to study the shores and especially the little known islands of the lake. Then the ethnologist Lieut. Von Wiese and the zoölogist Dr. Schubotz separated from the party to try the crossing of the continent in a more southerly direction, the former succeeding along the courses of the Ubangi and Mbomu rivers, the latter along the Welle, to the Bahr-el-Ghazal and the Bahr-el-Gebel rivers, respectively. The rest of the main expedition, consisting of the Duke, the physician Dr. Haberer, and the painter Mr. Heims, separated temporarily in their turn: the first two penetrated into Bagirmi as far as Melfi, returning through *terra incognita* via Busso (on the Shari) and Bongor (on the Logone) to Garua on the Benue, where they were again joined by Heims who had in the meantime explored the Musgum country in the German part of Bornu. From there they went down the Benue and Niger to embark for home at the rising port of Forcados, Niger Delta. The two gentlemen of the Kamerun expedition made an additional trip to the islands of Fernando Po and Annobon.

This division of labor naturally makes the reports somewhat unlike in character, because each scientist reports on the territory visited by him from his special scientific point of view. The reports, with the possible exception of the South Kamerun branch, do not therefore give truly all-round geographical pictures of their respective territories. But even so they contain much new information of high geographical value on the parts of Africa visited.

The South Kamerun expedition gave much attention to the topography of the country. It was ascertained to be a peneplain sloping gently toward the Sanga River and not exceeding 900 meters in height, which is below earlier suppositions. Only its western parts show a greater variety of relief and a greater height of individual peaks. Zoölogically the region belongs to the Congo province, the transition to the coastal fauna being very gradual. The entomological discoveries were gratifying. The flora showed several distinct provinces which seemed to correspond to political (ethnological?) divisions. It is a pity that, especially near the leading roads, the original condition of the vegetation is fast disappearing, so that a scientific study of it will soon be impossible.

In Dr. Schubotz's expedition the zoölogical interest was predominant. He wished to ascertain the boundary between the faunas of the tropical forest and the steppe. He found that the forest represents a zoölogical unit by itself, perhaps the most clearly defined zoölogical sub-region of Africa. The fact that certain forms have been found so far only in one or another part of it is not a proof of the contrary but is easily explained by the vastness of the territory and our insufficient knowledge of it, and by the comparative scarcity of the forms themselves. Of the most coveted of them, the okapi, Dr. Schubotz killed two, taking also the first photograph of a freshly killed one. The "gallery" forests which skirt the rivers in the border region of the forests proper, are probably relicts of them, and derive their fauna from them. The fauna of the steppe, on the other hand, seems to be derived from another zoölogical center, which may have been located in North Africa.

Ethnological discovery was the main object of Von Wiese's expedition, but it was richly supplemented by other work. This is especially gratifying because the progress of "civilization" even in remote parts of Africa makes the securing of genuine material and information more difficult every year. At Fort Lamy (Bagirmi) a native tailor's shop was even found to contain a sewing machine!

The Duke himself collected a large amount of perfectly new material on Islam in North Kamerun. Elaborate question blanks supplied by the Colonial Institute at Hamburg were answered *in situ,* valuable native manuscripts were secured and several native scribes wrote historical and genealogical data of their tribes for the expedition. From the evidence thus collected it appears that Islam was introduced into these regions from the north, *e. g.*, from the western Sahara, with the exception, of course, of the Arabs who are of eastern origin and share the beliefs of the East.

The linguistic conditions in the Duke's field of work were very complicated. The three principal idioms of Africa meet there: the Hamitic, Sudanese, and Bantu languages, all of them interspersed with Arabic acquisitions. The linguistic collection of the combined expedition comprises specimens of seventy-one different languages, including forty phonograms, which will afford quite a new basis for African philology. The purely ethnological collections contain about 4,300 pictures, photographs, and drawings, together with over 4,000 ethnological objects. Of especial interest is the description of the Pygmies in the report of the South Kamerun expedition who seem to be related to the Pygmies of the upper Nile, although much of their civilization and even many words of their language are borrowed from their negro neighbors. In Von Wiese's report, the tribes between the Shari and Ubangi rivers, some of whom had not been visited since the days of Junker and Marchand, present a strange combination of native Arabic, and European customs and influences. The three sultanates of the Asande: Bangassu, Rafai, and Semio, which were chosen for temporary headquarters, afforded the author ample opportunity to study both the character and condition of the people, and the methods of the French government. Unfortunately the influence of the latter is very small in these far-away regions, as Von Wiese experienced himself in a very annoying way by the difficulty of securing the necessary number of carriers.

MARTHA KRUG GENTHE.

ASIA

Turkestan. By Prince V. I. Massalskyĭ. Vol. 19 in the Series: Russia. A Full Geographical Description of Our Country. Under general supervision of P. P. Semenov-Tian-Shansky, and V. I. Lamanskyĭ. Edited by V. P. Semenov-Tian-Shansky. [In Russian]. x and 861 pp. Maps, ills., bibliog. index. A. F. Devrien, St. Petersburg, 1913. Roubles 5.50. 9 x 6½.

The author's aim is to show what development has been made in Turkestan since the Russian occupation over forty years ago. As Turkestan has great industrial importance, over a third of the book is given to economic topics, such as laws governing the distribution of water for irrigation, new irrigation works, railroads, etc. Special attention is given to cotton, silk and fruit growing. The author thinks that the Khanates of Bhokara and Khiva must fully be brought under the Russian régime for their own good and that of the rest of Turkestan.

The Land of the Blue Poppy. Travels of a Naturalist in Eastern Tibet. By F. Kingdon Ward. xii and 283 pp. Maps, ills., index. University Press, Cambridge, 1913. G. P. Putnam's Sons, New York. 12s. 9½ x 7.

The author has touched little fresh territory in this volume. But eastern Tibet has been so little explored that even in the footsteps of others each new-comer can find much of interest. Mr. Ward entered the region on a botanical mission and therefore the trees of the mountains and the flower of the field engage our attention in these pages. The record day by day cannot fail of interest, for the author is most observant.

Zeemansgids voor den Oost-Indischen Archipel. 5 vols. with supplements. 3d edition. Ministerie van Marine, Afdeeling Hydrographie. Mouton & Co., The Hague, 1912. 9 x 6 each.

An official series of guide books prepared for navigators in the waters of the East Indies Archipelago with descriptions of prevailing wind and weather, currents, tides, and coasts, harbors, anchorages, etc., and a supplement to each volume showing profiles of coasts.

The Progressing Philippines. By Charles W. Briggs. 174 pp. Maps, ills., index. Griffith & Rowland Press, Philadelphia, 1913. 50 cents. 8 x 5½.

This small volume written by a missionary as a text book for classes in mission study gives a brief survey of the geography, ethnology and history of the Philippines and a more extended account of the religious progress and status of the Filipinos. It is illustrated with a large number of photographs, many too small to be of value. If any criticism on the side of geography is just of a book so avowedly a study of missionary fields it would be that the controlling causes of the life of the natives are not sufficiently explained. The account of the Filipinos and the social classes on the islands is more extended. This to the lay reader is the most valuable part of the book. After a brief history of the Philippines from the discovery by Magellan, the author discusses the religious evolution of the people. In this he has some views that will not meet with general acceptance. ROBERT M. BROWN.

AUSTRALASIA AND OCEANIA

The Making of the Australian Commonwealth, 1889-1900. A Stage in the Growth of the Empire. By Bernhard R. Wise. xiii and 365 pp. Index. Longmans, Green & Co., New York, 1913. $2.50. 9 x 6½.

This is not a study in government but a record of the brief struggle for Australian federation. The scene of the book is New South Wales, although appendixes give a brief review of the situations in Tasmania and Victoria. A chronological account of events which centered around a few leaders for and against the more independent government policy is the story of the book.

ROBERT M. BROWN.

New Zealand and Adjacent Islands. By P. Marshall. 79 pp. Maps. Carl Winter, Heidelberg, 1912. 10½ x 7.

This convenient work was designed to be a chapter in Steinmann and Wilcken's encyclopedic handbook of regional geology. Abstracted for separate publication it loses the advantage of its position in the greater work and impresses at first sight with a sense of cramped presentation. Yet it will be found a concise and clear statement of the great geological movements of New Zealand and a very complete reference to the literature of the subject. No one could be in better position to condense the knowledge of New Zealand, its modern geography and the land building forces which at several epochs have acted upon the islands, than Prof. Marshall, for his text book of the geography of New Zealand stands as the standard work. It is interesting to observe that he has been content to summarize the various opinions about the recently extinct moa without committing himself to any opinion of his own. It calls for scientific fortitude in New Zealand to refrain from a theory of that remarkable fowl.

Twenty-One Years in Papua. A History of the English Church Mission in New Guinea (1891-1912). By Arthur Kent Chignell. xv and 157 pp. Map, ills. The Young Churchman Co., Milwaukee, 1913. $1. 7½ x 5.

The scene of this unpretentious yet important little volume is the north shore of the southeastern extension of New Guinea from Samarai to the German boundary line. Effectively it covers not much more than the distance to the second cape to the northwest, for the progress of all mission labor in New Guinea has been as slow as it is dangerous. With great sacrifices the missionaries who have worked upon this coast (among the pioneers this author stands), have given us all we know of the geography and ethnology of the region and for a long time to come we shall have to rest upon their endeavors. Having made a reconnaissance of that shore line several years before it was assigned to the Church Missionary Society I can certify to the essential accuracy and value of the geographical material contained in this narrative.

WILLIAM CHURCHILL.

The Belief in Immortality and the Worship of the Dead. By J. G. Frazer. Vol. 1: The Belief among the Aborigines of Australia, the Torres Straits Islands, New Guinea and Melanesia. The Gifford Lectures, St. Andrews, 1911-12. xxi and 495 pp. Index. The Macmillan Co., New York, 1913. $3.25. 9 x 6.

With this volume Dr. Frazer begins a work which may be expected to rival the "Golden Bough" in magnitude. He follows exactly the same method in this as in the former work, very encyclopedic in the massing of material from every source, diffuse and oppressive by its mass. He does not yet make clear to what end these new studies are directed, therefore we have no hint as to the theory of interpretation with which we should regard this mass of data.

We may properly assume that it is only for mechanical reasons in making a volume that in this first volume he deals with cultures so diverse as the Australian and the Melanesian, for there can be no logical association of the wanderers of the continent and the sedentary societies of the islands.

A much more grave defect of this work is that while Dr. Frazer assembles a large amount of material germane to his topic, so much material that we may feel convinced that it was his intention to gather up all with no omissions, he does not undertake to evaluate any of the material. I do not assume to comment upon this matter in reference to the Australians, for my acquaintance, even in part familiarity, with those races is just sufficient to serve as a warning against rash criticism. But Melanesia I know, with the literature of the subject I am familiar and have enjoyed the opportunity to subject it to critical examination in the field. I instance this objection by citing the lectures upon Fijian custom. Dr. Frazer gleans, rather he reaps, the crop from Williams, from Fison, from Basil Thomson, yet nowhere does he suggest that these authorities widely vary. Williams had the advantage of being early in the field, of observing each detail of custom while it was still a matter of living faith. That should stamp him as an authority of the first rank. Unfortunately his record is under grave suspicion; we know it to have been falsified and the original is no longer recoverable. Lorimer Fison I knew in Fiji as a very careful observer so far as is possible to one who has had no schooling in ethnography, and the period of his observation has been the period when contamination with foreign vices and foreign virtues has become well established in Fijian life. Basil Thomson has observed with special skill, with an insight into the philosophy of culture and social life, but his observations are as modern as my own. Here we have the great objection to all of Dr. Frazer's work. The amount of information which he amasses is enormous, but quantity can never supply the place of quality. Lacking record of the competency of the witnesses we cannot estimate the evidential value of their testimony, therefore we lack confidence in the proof based upon such material.

Furthermore in the present volume Dr. Frazer seems to proceed on the assumption that death and the soul and life hereafter (he pays scant attention to the belief in a death of the soul as a terminus of a life hereafter) are matters of great importance. In the life of these primitives death is a negligible incident. The life after death seldom reaches the concept of immortality

and in common is looked forward to as an inconvenience which the soul must undergo and which it seeks to throw back upon the survivors of the family.

WILLIAM CHURCHILL.

EUROPE

The Story of the Forth. By H. M. Cadell. xvii and 299 pp. Maps, ills., index. James MacLehose & Sons, Glasgow, 1913. 16s. 10 x 7½.

The story of the Forth is a story worth reading and may well appeal to the physiographer, the student of industrial history or the engineer. Beginning in the remote past before the Carboniferous period, the reader is lead through various changes of landscape to the present. The chapter devoted to the long struggle for supremacy between the drainage of the Clyde and the Forth is the most interesting. The diagrams and the imaginary landscapes add much to the effectiveness of the presentation. The volume contains many excellent maps that should be studied by every student of European physiography for they present in clear and usable form the essentials of the physiographic history of the Forth so skillfully portrayed. From the physiographic standpoint the volume is a distinct contribution, none the less to be commended because it will appeal to the layman who can read it with understanding and interest.

RICHARD ELWOOD DODGE.

La Race Slave. Statistique-Démographie-Anthropologie. Par Lubor Niederle. Traduit du Tchèque par Louis Leger. Nouvelle Collection Scientifique. xii and 231 pp. Map. Félix Alcan, Paris, 1911. Fr. 3.50. 7½ x 4½.

With the question of Pan-Slavism always at the background of the politics and domestic statecraft of Eastern Europe this manual will serve to satisfy such as wish to acquire a superficial familiarity with the problems of Slavic life and to direct the more advanced studies of such as may be attracted to detailed investigation of a most interesting culture. The race has long existed without political entity. For centuries it has been the protesting and suffering minority in kingdoms and empires. It has by turns been used, been tolerated, been abused in Russia, in Austria and in Turkey. At this time of writing it is reconstructing the political map of the Near East. It is very timely that here we have a work in which we may study, at the pause before the recent wars broke out, the history and character of the peoples who have fought a way to the walls of tottering Constantinople. Prof. Niederle writes enthusiastically, he is proud of the history of his race, he feels the sting of its ages of suffering. Yet that does not detract from the value of the work as a compend of history. He wrote on this topic a few years earlier, a contribution to the work of the Imperial Academy of Sciences at St. Petersburg. It will readily be comprehended that the earlier work was written with reservations, but in this he has told the tale of his race as he thinks it should be told. We know of no work which will supply the detail with which this volume is crowded.

WILLIAM CHURCHILL.

Jahrbuch des k.k. hydrographischen Zentralbureaus im k.k. Ministerium für öffentliche Arbeiten. Vol. 15, 1907, and Vol. 16, 1908. Maps, diagrams in each. Wien, 1910 and 1911. 15½ x 11 each.

This publication (quarto), issued annually since 1893, gives a complete review of the hydrographic conditions in Austria-Hungary and in the foreign districts tributary to the waterways of the Empire for each year under review. The year book for 1908 contains, for example, the results of observations from 3,163 stations of which 2,702 are in the Empire and 461 in adjoining territories. The general part (57 pp.) gives tabular summaries of results in each of the river basins with explanatory remarks and graphs showing the daily standard of water at the most characteristic stations. This summarized information for the Empire as a whole is given in complete detail in the thirteen accompanying parts, each relating to the territory tributary to one of the thirteen river basins and each illlustrated by a fine map of the basin under discussion.

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Narratives of the Indian Wars, 1675-1699. Edited by Charles H. Lincoln. xii and 316 pp. Maps, index. Charles Scribner's Sons, New York, 1913. $2.50. 9 x 6.

Hamilton, Canada. Its History, Commerce, Industries, Resources. Issued under the auspices of the City Council in the Centennial Year 1913. 251 pp. Ills. Herbert Lister, Hamilton, Canada. 9 x 6½.

Summer Provinces by the Sea. A description of the Vacation Resources of Eastern Quebec and the Maritime Provinces of Canada, in the territory served by the Canadian Government Railways:—Intercolonial Railway, Prince Edward Island Railway. Written and arranged by Romaine Callender. 310 pp. Ills., index. Intercolonial Ry., Moncton, N. B. 9 x 6½.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. GEOLOGICAL SURVEY

Topographic Sheets

(Including Combined and Special Topographic Maps)

Arizona. Winkelman Quadrangle. Surveyed in 1910 and 1911. 1:125,000. 33°0′ - 32°30′ N.; 111°0′ - 110°30′ W. Contour interval 100 ft. Edition of Oct. 1913.

Colorado. Red Mesa Quad. Surveyed in 1911. 1:62,500. 37°15′ - 37°0′ N.; 108°15′ - 108°0′ W. Interval 50 ft. Edit. of Oct. 1913.

Georgia-Tennessee. Cohutta Quad. Surveyed in 1911. 1:62,500. 35°0′ - 34°45′ N.; 84°45′ - 84°30′ W. Interval 50 ft. Edit. of Nov. 1913.
[Coextensive with the northeast quarter of the old Dalton, Ga.-Tenn., sheet, 1:125,000, originally surveyed in 1886 and revised in 1895.]

Kentucky. Buckhorn Quad.* Surveyed in 1911. 1:62,500. 37°30′ - 37°75′ N.; 83°30′ - 83°15′ W. Interval 50 ft. Edit. of Sept. 1913.
[Coextensive with the northwest quarter of the old Hazard, xx Ky., sheet, 1:125,000, originally surveyed in 1889.]

Maryland. Indian Head Quad.* Surveyed in 1900 and 1911. 1:62,500. 38°45′ - 38°30′ N.; 77°18′ - 77°0′ W. Interval 20 ft. Edit. of Nov. 1913.
[Coextensive with the southeast quarter of the old Mt. Vernon, Va.-Md., sheet, 1:125,000, originally surveyed in 1885-88, revised in 1894. The Virginia portion of the Indian Head sheet is blank.]

Minnesota. Fergus Falls Quad.* Surveyed in 1911. 1:62,500. 46°30′ - 46°15′ N.; 96°15′ - 96°0′ W. Interval 10 ft. Edit. of Sept. 1913.

Montana. Cherry Ridge Quad. Surveyed in 1903 and 1910. 1:125,000. 49°0′ - 48°30′ N.; 109°0′ - 108°30′ W. Interval 20 ft. Edit. of Aug. 1913.
[The southern half of this sheet has already been published on the scale of 1:62,500 as the Harlem and Wayne Creek sheets. A note says that the elevations on the Cherry Ridge sheet are 6 ft. too low.]

Ohio. (a) Jackson Quad.* Surveyed in 1910-1911. 1:62,500. 39°15′ - 39°0′ N.; 82°45′ - 82°30′ W. Interval 20 ft. Edit. of Oct. 1913.
(b) Era Quad.* Surveyed in 1911. 1:62,500. 39°45′ - 39°30′ N.; 83°15′ - 83°0′ W. Interval 20 ft. Edit. of Oct. 1913.

Ohio-Michigan. (a) Alvordton Quad.* Surveyed in 1911. 1:62,500. 41°45′ - 41°30′ N.; 84°30′ - 84°15′ W. Interval 10 ft. Edit. of Oct. 1913.
(b) Wauseon Quad.* Surveyed in 1911. 1:62,500. 41°45′ - 41°30′ N.; 84°15′ - 84°0′ W. Interval 10 ft. Edit. of Nov. 1913.

Wyoming. (a) Meeteetse Quad. Surveyed in 1911. 1:62,500. 44°15′ - 44°0′ N.; 109°0′ - 108°45′ W. Interval 25 ft. Edit. of Nov. 1913.
(b) Oregon Basin Quad. Surveyed in 1910-1911. 1:62,500. 44°30′ - 44°15′ N.; 109°0′ - 108°45′ W. Interval 25 ft. Edit. of Oct. 1913.
[Except for the Rock Springs quadrangle, the first topographic sheets to be published on this relatively large scale of any part of Wyoming.]

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* On these sheets woods are shown in green.

NORTH AMERICA

Mexico

Tamaulipas-Vera Cruz. General Map of the Mexican Gulf Coast's Oil Fields. Compiled by N. Paulsen-Bildø, Civil Engineer. Tampico, Tamps., Mexico, 1912. 1:100,000. 43 colors. [Five sheets:] (1) 22°55′ - 22°10′ N.; 98°22′ - 97°7′ W. (2) 22°10′ - 21°25′ N.; 98°22′ - 97°7′ W. (3) 21°25′ - 20°40′ N.; 98°22′ - 97°7′ W. (4) 23°40′ - 22°55′ W.; 98°22′ - 97°7′ W. (5) 24°0′ - 23°40′ N.; 98°22′ - 97°7′ W. Published by N. Paulsen, Station O, Box 72, New York, N. Y.

[Valuable general map of the Mexican Gulf coastal plain showing, in colors, the location and extent of the various oil grants. The outline is based on the relevant sheets of the topographic map of Mexico (see *Bull.*, Vol. 45, 1913, pp. 636-637) on the same scale. There are nine symbols for towns according to importance, six for estates, ranches and single houses, three for railroads, four for roads and paths, and four for boundaries. Pipe lines are shown, and distinction is made between wells producing, being drilled and not producing. Forty-three colored symbols are used to distinguish the ownership of the various holdings of oil land. This is the most valuable feature of the map, being based on original compilation, and affords particularly timely information in view of the recent operations of the rebels in the vicinity of Tuxpam.]

Vera Cruz. Vera Cruz-Llave. Traced by N. Paulsen, Civil Engineer. Aug. 1912. 1:250,000. 22°45′ - 20°0′ N.; 98°50′ - 96°50′ W. Published by N. Paulsen, Station O, Box 72, New York, N. Y.

[Traced from the official map published by the state of Vera Cruz. Oil wells (producing, being drilled, not producing) shown.]

AFRICA

Belgian Congo. Lage des neuen Vulkans am Kiwu-See nach einer Skizze von Leutnant Kohl. 1:150,000. 1°3′ - 1°43′ S.; 29°5′ - 29°16′ E. Accompanies, on p. 161, "Der vulkanische Ausbruch im Norden des Kiwu-Sees vom 4. Dezember 1912 bis 2. Januar 1913," *Mitt. aus den Deutschen Schutzgeb.*, Vol. 26, 1913, No. 2, pp. 159-163.

[Lava flows from new crater shown. Relief of region immediately to the north of Lake Kivu shown in contours.]

French Equatorial Africa. (a) Le Bas-Ogooué et les Lacs. Reconnaissances effectuées en août, septembre, octobre, 1911. 1:1,000,000. 0°20′ - 1°40′ S.; 8°40′ - 10°20′ E.

(b) [27 maps of individual lakes, Nos. 1-9 on the scale of 1:200,000, the remainder, 1:100,000:] (1) Lac Onangé. (2) Lac Ôgèmwe. (3) Lac Ezanga. (4) Lac Azingo. (5) Lac Avanga. (6) Lac Zilè. (7) Lac Adolè. (8) Lac Gômè. (9) Lac Logè. (10) Lac Mômbwè. (11) Lac Nkôvè. (12) Lac Ôgondwè. (13) Lac Igulwè. (14) Lac Dégèlè. (15) Lac Evengô. (16) Lac Myoniè. (17) L. Wombolia. (18) Lac Nkèniè. (19) Lac Nyogo. (20) Lac Nyonjè d'aval. (21) Lac Nyayè. (22) Lac Nyonjè d'amont. (23) Lac Ôgôgwè. (24) Lac Anenge. (25) Lac Manjè. (26) Lac Alombié. (27) Lac Ompindalango.

Accompany, map (a) as Pl. IV on p. 424, maps under (b) as Pls. V-VIII on pp. 425-428, "Les lacs du Bas Ogooué: Mission hydrographique du Gabon" by M. Le Terrier, *La Géogr.*, Vol. 27, 1913, No. 6, pp. 405-428.

[Maps under (b) detailed maps of the lakes accompanying the Ogowe River in its course through the coastal plain. Map (a) a general map showing the whole system of lakes.]

French Sudan. (a) Croquis de la Subdivision de Zigueï. Par le lieutenant A. Peignot. 1:500,000. 14°55′ - 14°18′ N.; 15°16′ - 16°10′ E.

(b) Croquis au 100,000e de la région de Bir Alali . . . montrant le parallélisme des massifs dunaires et des *ouaddis*. Levé par le lieutenant A. Peignot. 1:100,000. [14°27′ N. and 15°25′ E.]

Accompany, as Figs. 28 and 29 on pp. 322 and 323, respectively, "Notice

sur la subdivision de Ziguë'' by A. M. Peignot, *La Géogr.*, Vol. 27, 1913, No. 5, pp. 321-330.

[Interesting maps of a small plateau in the savanna region of the Sudan northeast of Lake Chad. The plateau, which consists of clay, is cut by numerous NNW-SSE trending *wadis*. Across these the *harmattan* wind has blown the loose sand originating from the southern edge of the Sahara into series of dunes which have been fixed by vegetational growth. The map distinguishes between the dunes, the *wadis* and the clay subsoil. Map (b) is an enlargement of a section of map (a).]

German East Africa-British East Africa. (a) Das abflusslose Gebiet des nördlichen Deutsch-Ostafrika. 1:1,000,000. 0°50′ - 4°35′ S.; 32°46′ - 37°9′ E. [Three maps:] (1) Wasserscheiden und Landschaftgrenzen. Entworfen von F. Jaeger. 4 colors. (2) Geologische Karte. Entworfen von F. Jaeger. 13 colors. (3) Vegetationskarte. Entworfen von F. Jaeger. 12 colors.

(b) Reiseweg Dr. F. Jaeger's in der Massai-Steppe. 1:1,000,000. 3°22′ - 5°41′ S.; 37°5′ - 38°33′ E.

Accompany, maps under (a) as Karten 4, 5, and 6, respectively, and map under (b) on p. 3, ''Das Hochland der Riesenkrater und die umliegenden Hochländer Deutsch-Ostafrikas: Teil II (Länderkundliche Beschreibung)'' by F. Jaeger, *Ergänzungsheft Nr. 8 der Mitt. aus den Deutschen Schutzgeb.*, 1913.

[Maps under (a) are general maps of the district lying between Mt. Kilimanjaro and Lake Victoria, based on Sheet 17 of the Grosser Deutsche Kolonialatlas, a_1 representing topography, a_2, geology, and a_3, vegetation. Map a_1 represents relief in approximate contours and shading in brown. The detailed surveys which accompanied Teil I of this monograph (maps (2) and (3) listed under ''German East Africa'' in *Bull.*, Vol. 43, 1911, pp. 547-548) are incorporated on this map. Besides relief, watersheds and boundaries of natural regions are also shown, as the title indicates. On map a_2 twelve geological formations are distinguished, and faults are shown especially prominently in view of their importance in the structure of this region, which includes the Great Rift Valley. Three kinds of faults are distinguished according to the height of the throw. On map a_3 eleven plant formations are shown. Map (b) is a black-and-white text map showing mainly the Pangani depression, with relief in approximate contours. The monograph which these maps accompany, and especially Chapter 16, is a model of a systematic regional treatment according to modern geographical methods.]

Italian Somaliland. (a) Somalia Italiana: Zona d'Influenza Commerciale. 1:4,000,000. 12°40′ N. - 0°40′ S.; 37° - 53° E. 6 colors.

(b) Circosrizioni Amministrative e Militari nella Somalia Italiana Meridionale. 1:2,000,000. 5°20′ N. - 0°20′ S.; 41°40′ - 48°40′ E. 8 colors.

(c) Carta Dimostrativa della Somalia Italiana Meridionale compilata da E. Carcoforo. Riproduzione di M. Checchi ed A. Marconi. 1:1,000,000. 6°0′ N. - 0°20′ S.; 42°0′ - 46°40′ E. 6 colors. With inset: [Northern continuation of the Webi Shebeli]. 1:750,000. 6°0′ - 5°15′ N.; 43°50′ - 45°0′ E. 1 color.

Accompany *Rivista Coloniale,* Vol. 8, Part I, Nos. 2 and 3, and Part II, No. 1, respectively.

[Map (a) shows the political divisions of the Somali Peninsula (French, British and Italian Somaliland and Abyssinia) and the chief routes of communication. Map (b) represents the civil and military administrative units and indicates, by means of 26 symbols, the location of such offices as custom houses, post offices, wireless telegraph stations, etc. These two maps were previously published in ''La Somalia Italiana nei tre anni del mio governo'' by G. De Martino, the governor of the colony. Map (c) is an important large-scale map of southern Somaliland, which distinguishes between (1) cultivated areas and pastures, (2) scrub and (3) forests. Roads, as far as built, and routes traversed by Europeans and from native report are shown. This map, which is officially published by the Government of Italian Somaliland, also appears in *L'Africa Italiana,* Vol. 32, 1913, No. 3-6.]

Portuguese West Africa-German Southwest Africa. Karte des Deutsch-Portugiesischen Grenzgebiets in Südwestafrika. Bearbeitet unter Leitung von Paul Sprigade von H. Nobiling. Das portugiesische Gebiet auf Grundlage einer Bearbeitung von Dr. Max Groll. Blatt 2. 1:500,000. 15° - 19° S.; 15°15′ - 19°10′ E. 5 colors. Accompanies, as Karte 4, ***Mitt. aus den*** *Deutschen Schutzgeb.*, Vol. 26, 1913, No. 2.

[The second sheet of this important three-sheet map of the adjoining portions of Portuguese West and German Southwest Africa, the first of which was listed, with comment, under the same head in the *Bull.*, Vol. 45, 1913, No. 9, p. 718. The present map, which adjoins the first sheet to the east, includes the northern part of the Etosha Salt Pan.]

Togo. Karte des Sechsherrenstockes (bisher Kunjagebirge genannt). Nach den Aufnahmen des Regierungsrats Dr. H. Gruner unter Leitung von P. Sprigade bearbeitet und gezeichnet von H. Ketzer. 1:50,000. 7°22.5′ - 7°6.5′ N.; 0°19.3′ - 0°29.6′ E. 2 colors. Accompanies, as Karte 3, "Begleitworte zur Karte des Sechsherrenstocks (Amandeto)" by H. Gruner, ***Mitt. aus den*** *Deutschen Schutzgeb.*, Vol. 26, No. 2, pp. 127-158.

[The Sechsherrenstock, or, as they have been called heretofore, the Kunja Mts., are a western outlier of the Togo Mts., lying between their main axis and the depression of the Volta valley. They were almost unknown until the expeditions of the author, on whose route surveys the map is based. Relief shown in approximate contours in brown; boundaries of native districts in red.]

WORLD AND LARGER PARTS

World. Carte Générale Bathymétrique des Océans. Publiée par le cabinet scientifique de S.A.S. le Prince de Monaco. [Mercator's projection; equatorial scale, 1:10,000,000.] [Eight sheets:] (1) Feuille A I. Revised to May 1, 1912. 46⅔° N. - 0°; 90° W. - 0°. 19 colors. (2) Feuille A II. Revised to May 1, 1912. 46⅔°; N. - 0°; 180° - 90° W. 17 colors. (3) Feuille A III. Revised to Dec. 31, 1912. 46⅔° N. - 0°; 90° - 180° E. 22 colors. (4) Feuille A IV. Revised to Dec. 1, 1912. 46⅔° N. - 0°; 0° - 90° E. 19 colors. (5) Feuille A′I. Revised to July 1, 1913. 0° - 46⅔° S.; 90° W. - 0°. 19 colors. (6) Feuille A′II. Revised to July 1, 1913. 0° - 46⅔° S.; 90° - 180° W. 16 colors. (7) Feuille A′III. Revised to Sept. 1, 1913. 0° - 46⅔ S.; 90° - 180° E. 20 colors. (8) Feuille A′IV. Revised to Sept. 1913. 0° - 46⅔° S.; 0° - 90° E. 17 colors. Institut Océanographique, Paris.

[Eight sheets (comprising the zone between 46⅔° N. and 46⅔° S.) of a new edition being published of this standard bathymetrical map of the oceans. The distinctive feature of the new edition is that the relief of the land is also shown. The same contour intervals are used for the hypsometric tints in brown as for the bathymetric tints in blue, namely 0, 200, 500, 1000, 2000 meters and so forth for every 1000 meters. This uniform treatment of both the land and water areas increases the value of the map in making possible a correlation of the structural features of the globe. Incidentally it reveals the well-known fact of how inferior is our knowledge of the form of the ocean floor as compared with that of the land surface: vast areas have not yet been reached by the sounding lead (for valuable survey of known areas see map by L. Carrier, listed under "World" in the *Bull.*, Vol. 44, 1912, p. 239). The changes necessitated by the addition of new data is well brought out by comparing the new with the old edition of Sheet A III, which includes some of the troughs of the Western Pacific. Hardly an isobath has retained its original form, and even islands have disappeared. Although the Philippine, Liu-Kiu, Pelew and Yap Troughs are so designated on this sheet, the substitution of the artificial system of designating troughs by the names of vessels or men connected with their exploration for the more rational geographical names used in the first edition, as the Tuscarora and Nero Deeps for the Japan and Mariana Troughs, respectively, seems regrettable. On the other hand, a laudable tendency is noticeable on this and other sheets to restrict the area of the platforms of oceanic islands, which on the previous edition appeared too broad. The general change in the color scheme for water on all the sheets has, if anything, increased the plasticity of the map. Deeper shades of blue are used, as a

rule; this allows the use of a pale blue for the continental shelf instead of the white of the previous edition without impairing the fundamental contrast between it and the abyssal depths. Each sheet is accompanied by a list of sources for both bathymetry and hypsometry, the sources for the latter sometimes being perforce of so general a nature as school wall maps.]

EDUCATIONAL

United States. The Illustrative Historical Maps: Territorial, Administrative, Political, Discoveries, Military Campaigns. By E. G. Foster. [Thirty-three plates, on various scales and in 1-6 colors, viz.:] 1. Early Explorers and Discoverers. 2. Spanish Explorations in North America. 3. (a) French Explorations. (b) The Dutch and Swedes in America. 4. (a) The London Co., 1609. The Plymouth Co., 1620. (b) The London and Plymouth Companies, 1606. 5. (a) The New England Grants. (b) The Development of the New England States. 6. (a) Grants to the Middle Colonies. (b) The Development of the Middle States. 7. (a) The Southern Grants. (b) The Development of the Southern States. 8. North America, from 1755 to 1763. 9. Result of the French and Indian War, 1763. 10. (a) The Thirteen Colonies; Proclamation Line, 1763, and Quebec Act, 1774. (b) The Early Campaigns of the Revolutionary War. 11. Northern Campaigns of the Revolutionary War. 12. Washington's Campaigns. 13. Southern Campaigns of the Revolutionary War. 14. (a) Territorial Claims of the Thirteen Colonies. (b) The Northwest Territory and the Territory Southwest of the Ohio River. 15. Drainage Map. 16. Our Country at the Close of the Revolutionary War, 1783. 17. [Diagram showing the development of the political parties.] 18. Louisiana Purchase of France, 1803. 19. War of 1812. 20. The Missouri Compromise and Florida Treaty. 21. The United States, 1837, and the Republic of Texas. 22. (a) The Oregon Country. (b) The Maine Boundary, and Webster-Ashburton Treaty. 23. Our Country, 1846. 24. War with Mexico. 25. Our Country at the Close of the Mexican War, 1848. 26. The Compromise of 1850. 27. The Kansas-Nebraska Act, 1854. 28. Our Country, 1861-1865. 29. Grant's Campaigns in the West: The Siege of Vicksburg and Relief of Chattanooga. 30. Campaigns of Buell and Bragg. 31. Sherman's March to the Sea and Hood's Retreat. 32. Campaigns of the Army of the Potomac vs. the Campaigns of Robert E. Lee. 33. United States and Her Possessions, 1910. Published by Rand, McNally & Co., Chicago and New York. Revised 1910. Price $25.

[A serviceable set of wall maps illustrating the history of the United States. Aside from the first three plates, which deal with the history of discovery, the majority of the maps represent territorial and administrative changes and military campaigns. On each map is printed a concise statement of the events and conditions illustrated by it. On the whole the maps are drawn boldly enough for legibility at a distance. Several of the large-scale maps, however, are somewhat crudely drawn, as for instance map (11), on which, in the manner of a child's drawing, the region about Montreal and the Ottawa River is compressed, in defiance of scale, in order to include it on the plate, or map (12), on which the environs of New York are so inaccurately delineated that the shades of Washington, Howe and Clinton might have difficulty in recognizing respectively the sites of the Battle of Long Island, the disembarkment at Gravesend Bay or the voyage around the southeastern side of Staten Island. The maps are printed on stout paper and are held together by rings which pass through eyelets on their lower edges. By means of an ingenious rack arrangement, they can be hung from eyelets in their upper edges and displayed by unhooking them and dropping them down one by one.]

Other Maps Received

EUROPE

Austria-Hungary. Übersichtskarte der Betriebslinien der Ersten k. k. priv. Donau-Dampschiffahrts-Gesellschaft. 1:2,500,000. Auflage 1910. Ausgeführt im k. u. k. Militärgeographischen Institute, Wien.

Übersichtskarte des Donau-Oder-Weichsel- und des Weichsel-San-Dniester-

Kanales. Tafel 1. 1:750,000. Ausgeführt im k. u. k. Militärgeographischen Institut. [Wien].

Carte Géologique de la Hongrie, publiée par la Société Géologique de Hongrie avec le concours de l'Institut Royal Géologique de Hongrie et de Mr. A. de Semsey. 1:1,000,000. Budapest, 1896.

Balkan States. Königreich Bulgarien und die zentralen Balkanländer, zwischen Adria und Pontus. 1:864,000. III. Auflage. Äussere Grenzen nach dem Londoner Präliminarfrieden, innere Grenzansprüche Juni 1913. Nach Originalmaterialien zusammengestellt von Dr. K. Peucker. Artaria & Co., Wien.

[For earlier edition see under "Balkan Peninsula," *Bull.*, Vol. 45, p. 560.]

Kriegskarte der Balkanhalbinsel. Paul Langhans, [author]. 1:1,150,000. [With insets]: Strasse der Dardanellen, 1:500,000; Der Bosporus, 1:500,000; Constantinopel, 1:150,000; Athen und Piraeus, 1:150,000; Mitteleuropa und der Orient: Kretas strategische Stellung im östlichen Mittelmeer, 1:15,000,000. Auf Grund von Karten aus Stielers Handatlas von C. Vogel u. B. Domann. Justus Perthes, Gotha.

Tageskarte zur Serbischen Frage. 1:1,000,000. With inset: Mitteleuropa und der Orient. 1:10,000,000. Justus Perthes, Gotha.

Gli Stati Balcanici, Grecia e Impero Ottomano (Albania-Macedonia-Asia Minore). 1:2,800,000. G. B. Paravia & Co., [Toronto].

France. Massif du Ballon d'Alsace: Sentiers skiables, Carte au 1:50,000, de la Société de Ski de Belfort. [Belfort, 1912].

Germany. Höhenschichtenkarte vom Steigerwald. Herausgegeben im Auftrage des Steigerwald-Klubs unter Mitarbeit des derzeitig 1. Vorsitzenden P. Arauner, Kitzingen a. M. 1:100,000. H. Kahle, Eisenach.

Verwaltungsbereich der Königlichen Generaldirektion der Sächsischen Staatseisenbahnen, 1912. 1:600,000. [Königlich Sächsische Staats-Eisenbahnen, Dresden].

Iceland. Generalstabens Topografiske Kort. Sheets: 13 Bardaströnd S. A.; 14 Breidifjördur N. A.; 23 Gufudalur S. A.; 24 Fellströnd N. A.; 24 Fellströnd S. V.; 24 Fellströnd S. A.; 24 Fellströnd N. V.; 25 Hnappadalur N. A.; 33 Ospakseyri S. V.; 35 Nordurárdalur N. V.; 35 Nordurárdalur S. V. 1:50,000. Generalstabens topografiske Afdeling. Kjöbenhavn, 1913.

The Netherlands. Noordzee: Zeegat aan den Hoek-Van-Holland. 1:7,500. Samengesteld in 1912. Ministerie van Marine, Afdeeling Hydrographie, [The Hague]. Fl. 1.

Norway. Topografisk kart over kongeriget Norge. Sheets: 1 D. Mandal; 5 B. Grimstad; Z 2. Berlevaag; 32 B. Tryssil; 32 D. Engerdalen; 43 C. Holtaalen; 45 D. Edö; 48 B. Fröya; 56 A. Vikten. 1:100,000. Udgivet af Norges Geografiske Opmaaling, [Christiania].

Svolvaer Havn. 1:12,500. Utgit av Norges Geografiske Opmaaling. Kristiania 1913.

Aakre og Matrefjord. 1:100,000. Utgit av Norges Geografiske Opmaaling. Kristiania 1913.

Jernbaner i Norge. 1:2,600,000. With insets: Dampskibsruter og Forbindelser med Udlandet. 1:13,500,000; [Trondhjem district, 1:860,000]; [Bergen district, 1:860,000]; [Kristiania district, 1:860,000]. Statsbanernes Forlag, Kristiania, 1913.

Scandinavia. Generalkarta ofver Sverige, Norge och Danmark samt angransande delar af Östersjöländer, jämte Järvägs-Kommunikationer femte Tillökade och Förbättrade Upplagan. Författad och sammandragen i fyra Blad. I Skalan 1:1,000,000 af Nat. Storleken af August Hahr. Stockholm. Beijers Bokförlagsaktiebolag. [With insets: Norges Nordligaste Amt; Skanes Järnvägar, 1:700,000].

AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156TH STREET

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BULLETIN

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VOL. XLVI 1914 No. 3

RESULTS OF AN EXPEDITION TO THE CENTRAL ANDES*

UNDER THE AUSPICES OF THE AMERICAN GEOGRAPHICAL SOCIETY

By ISAIAH BOWMAN
Yale University

The three distinctive physiographic features of the Central Andes are a chain of interior basins with many salt lakes and vast marshy salars, the broadest and loftiest plateaus in the entire Andean Cordillera, and one of the few really great volcanic fields of the earth. In addition, a steep descent—a well-dissected fault scarp—defines the eastern margin, and a long barren coastal desert lies on the west. In the field of human geography the Central Andes form one of the most important groups of natural regions in the world. It is impossible to find elsewhere in South America an area of equal size with so great a variety of life. The density of population ranges from 100 to the square mile in the vicinity of Cochabamba, Bolivia, to $\frac{1}{10}$ to the square mile in the Territorio de los Andes, Argentina. Occupations run from the intensive agriculture of irrigated valleys to the pastoral nomadism of Alpine meadows; customs, from those of modern civilized people to those that bespeak an unmixed barbarism.

It is this extremely wide range in the physical conditions of the Central Andes that excites the interest of the geographer. The principles of geographic science rest upon the theory that man is to an important degree the product of the earth. In the varied physical environment of this great tract we should therefore expect

* "The Central Andes" is a proposed name for a group of closely related natural regions that lie between 12° and 26° south latitude.

climate and relief to exercise a high degree of influence upon the population. A study of its people should demonstrate both the scientific nature of geography and the wide application of its laws. Where then are the deserts, the vast river-threaded forests, the bleak tablelands, and barren mountain valleys? And what of man living under the stern conditions that these names imply? What is his life, his government, his character?

These considerations led me to undertake a line of work in South America that was begun in 1907[1], carried forward in 1911[2], and completed in 1913[3]. Notices and papers relating to the work of the first two expeditions have appeared in this *Bulletin.* It is proposed here to outline the principal results of the work of 1913. A preliminary note from the field appeared in the *Bulletin* for October, 1913. Later papers will deal with special problems; and the final results of the 1907 and 1913 expeditions will ultimately appear in book form. My warmest thanks are due the American Geographical Society for aid, without which it would have been impossible to complete the original plans. The generous spirit in which funds were appropriated is proof of the lively interest the Society is taking in field work as a basis of research.

In the account that follows I shall not attempt to give a narrative of the Expedition but shall leave that to the more extended treatment possible in the preparation of the final results; nor shall I include a complete account of the problems that were investigated. Thus little or nothing is said of the interesting physiography of the La Poma valley; the life of the Chaco territory; El Bramador, the roaring mountain of Toledo; geographic influences in the history of the early mining industry of Copiapó; the transmontane cattle trade and the effect of the rapidly changing trade routes of western Bolivia upon the fortunes of the highland people. It seems rather more appropriate briefly to outline a small number of leading problems.

The Eastern Border Region

In the course of two earlier journeys to the Central Andes I had become acquainted with northern Chile, western Bolivia, and southern Peru. The field work in 1913 was therefore carried into northwestern Argentina where terminates the great chain of interior basins that occupy depressions in the central plateau. It

1 The Yale South American Expedition of 1907.

2 As part of the work of the Yale Peruvian Expedition of 1911.

3 Expedition to the Central Andes, under the auspices of the American Geographical Society of New York.

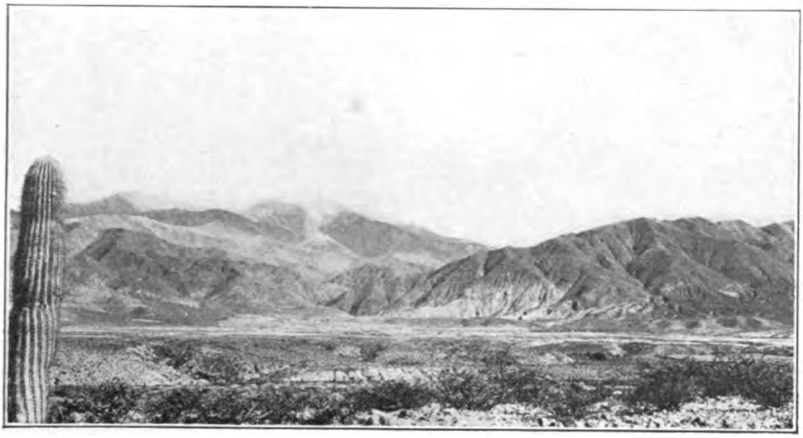


FIG. 1—Topography and vegetation at 10,000 feet, La Poma region, northwestern Argentina, lat. 26° S. Here occurs a valley desert where aridity combines with strong erosion to limit the amount of available water. Several thousand feet lower is the forest zone; several thousand feet higher are the grasslands of the Alpine country.

FIG. 2—Denser stands of timber in the forest zone that marks the belt of maximum precipitation above Rosario de Lerma, northwestern Argentina, 4,000–5,000 feet.

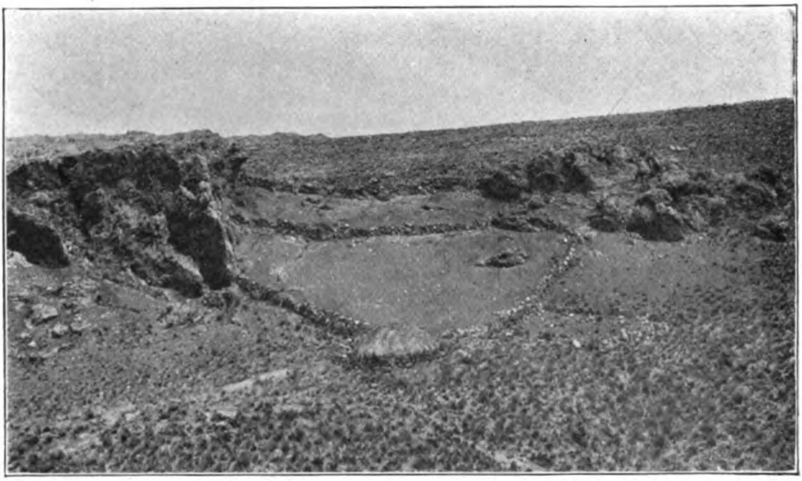


FIG. 3—Grass-thatched hut of a mountain shepherd, two days' journey west of Puno. *Ichu* grass in the foreground.

FIG. 4—Gauchos of the Chaco at Embarcacion, northern Argentina. The heavy cowhide flaps on the saddle front are a protection against the thorny shrubs through which the cowboy must ride in rounding up his stock for the long drive to the end of the railway.

is here also that the climate of the Central Andes is most extreme. The summer (January) sun raises the temperature to a high degree; the dust storms of midday hours give place at night to calms, and, in the clear skies of the horse latitudes in which the district lies, the thin air radiates its heat so rapidly as to fall below the freezing point. In winter, even the daytime temperatures do not rise above 35° to 55° F., and the night temperatures frequently fall below 0°F. The rainfall varies from ten to twenty inches on the eastern margin of the mountains to two inches in the driest parts of the Puna de Atacama. In the extreme climates of a region so broken and lofty the distribution and character of the population show striking responses to geographic conditions.

We found the zone of maximum precipitation on the mountains west of Salta to be marked by a belt of temperate forest between 4,500 and 6,000 feet. Above the forest, scattered groves occur in favorable places and belts of timber extend up the shadier and moister valley floors. The higher country bears a thin cover of herbaceous vegetation which gradually changes to the scattered clumps of *ichu* grass at the highest elevations. Up to 9,000 feet barley is grown; above that elevation potatoes are the chief vegetable product. The grasslands are the seat of pastoral population groups. In the forest, agriculture and grazing are combined. Below the forest a more intensive agriculture is practiced with irrigation. Those streams that have their chief tributaries in the forest belt are most constant in flow and furnish to the population groups on the mountain border the means for agriculture and stock raising on a large scale.

The variety of life on the eastern flanks of the Cordillera, due to the varied climate and resources that we have briefly sketched, is exhibited in a comparatively narrow zone owing to the abrupt nature of the mountain border. In a few days one may ride from the warm valleys at 4,000 feet to the bleak passes in the bordering ranges at 16,000 feet, crossing successively the belt of irrigation, the belt of forest and woodland, the belt of grasses, and the belt of barren mountain slopes and rock slides. It is but natural that there should be an intimate degree of intercourse between the people of these unlike regions. The wool and skins of the mountain shepherds are carried down by pack train to the railroad at Rosario de Lerma (thirty miles southwest of Salta); in the belt of forest besides vegetable growing ("habas", beans, potatoes, etc.) woodcutting is a regular occupation for a limited number, to supply timber and fuel to the mines and firewood and building material

to the towns. The irrigated valley lands support herds of cattle and droves of mules for the transmontane trade with the nitrate country in the Desert of Atacama. So large and profitable is the trade since the fuller development of the nitrate industry that land values have risen enormously. Many families once poor land owners are now rich city dwellers. This is a phenomenon now common to the eastern agricultural provinces of Argentina but it is of recent development in the mountain provinces and in some cases is due to quite different stimuli: the railroad, the growing nitrate industry in Chile, the more rapid development of mining since the introduction of the railroad, and a host of minor causes.

Because it is the capital of the province in which these economic changes have been most marked Salta has been transformed in the last ten years. From a mountain village it has developed into a fair-sized city. Its people were once untraveled and its streets filled with pack trains bearing supplies that were in large part bartered rather than sold. Even its merchandise had only a few decades ago come largely from across the Cordillera, where Chilean railroads gave easier access to large commercial routes. Now it has a street-car line, big business houses, at least four large banks, and a considerable number of really modern homes. He who has visited Europe is no longer pointed out as a distinguished person. The dresses of the women are nearly as modern as may be seen on the streets of New York. One of the most elegant club houses in Argentina faces the well-kept plaza. The life of the people in a score of ways has taken on a degree of comfort and luxury hitherto almost unknown.

It is not possible to give within the limits of this short paper more than the briefest account of the work on the western border of the Argentine Chaco. It is here that cattle are gathered for shipment to the valley pastures at Salta and other districts on the west. From the railroad terminal at Embarcacion long lines of two-wheeled carts carry supplies northward to the Argentine-Bolivian border towns along the base of the mountains and to the oil fields at Cueva, Bolivia. A feeble down-stream trade by means of temporary rafts is carried on with the river villages below the Bermejo crossing. Through the terminal also come groups of Matacos Indians who spend part of their time on the sugar estates now developing rapidly on the plains along the border of the mountains. In oil, sugar, and cattle, we have examples of resources that are of much wider interest than the hides, feathers, wool, and grains for which the region was formerly known. It will therefore be

FIG. 5—The borax basin of Pastos Grandes, northwestern Argentina. In the background are lava flows. The white deposit is borax broken here and there by open water. The central hummocky ridge which separates the two parts of the basin is composed of basin sediments, finely stratified, thrown into low folds, and with a strong regional inclination toward the center of the present basin. The relations are typical of the three main basins along our route.

Fig. 6—Winter camp of mountain shepherds at Aguas Blancas near Soncor, Desert of Atacama, 9,000 feet. In the background is the great Salar de Atacama, the largest salt plain in South America.

Fig. 7—Oasis of Soncor, western border of the Maritime Cordillera, Chile, where a small mountain stream terminates near the edge of the Desert of Atacama.

seen that the geographic importance of the region on the common border of mountains and plains in northern Argentina depends not only upon minor products of local value but also upon commodities that enter into national and even international trade.

The Puna de Atacama

The physiographic studies which I have been able to carry out along five different routes running from one side of the Central Andes to the other make it possible to conclude that the whole region has suffered great uplift in relatively recent geologic time. In the Tertiary and early Pleistocene, uplift by at least 5,000 to 7,000 feet carried to its present elevation a relatively low-lying tract bordered by mountains of only moderate boldness. Were it not for the topographic irregularities caused by the volcanic eruptions of the period of uplift the mountains would be smooth-contoured, rounded, subdued. Their present ruggedness is due less to the great uplifts they have suffered and the dissection now in progress than to the volcanic cones and ragged lava flows built upon them.

The Puna de Atacama clearly exhibits this three-fold topographic complexity. It consists of a series of interior basins of great aggregate extent shut off on either hand from the Pacific and Atlantic drainage and also in general from each other by volcanic masses. Were one able to remove the volcanic material there would be revealed an older series of rocks on the one hand very complex as to structure and on the other very simple as to topography. Old schists, slates, limestones, and younger intruded granites, are faulted, folded, and mashed to such an extent that a detailed description of their structure would be hardly more than a long catalogue of facts. Few generalizations can be made save that the main structural lines trend with the topographic lines of the mountains. This implies repeated movements along established planes of fracture, repeated stresses along somewhat permanent axes, and at least some genetic relation between lines of fracture and folding and those recent volcanic outbursts that have increased the height and ruggedness of the mountains. Before the period of volcanic activity had set in, the topography had ceased in large measure strongly to reflect the structure. Erosion had been so long continued that the rugged forms of a youthful landscape had become the subdued forms of a late-mature landscape. Where volcanic material is absent as in the Pre-Cordillera, northeast of Tucuman, and in the ranges between Rosario de Lerma and La Poma, the older topography stands out in marvellous contrast to

the ragged border of the sierras crowned by roughened volcanic material and cut into a labyrinth of spurs and canyons by a multitude of streams.

A high degree of interest surrounds the physiographic problems of the Puna because of the stage in the arid cycle that the topography had reached before the main volcanic period had opened. As we have just seen, mature forms were developed upon an older surface of erosion. Therefore in the pre-volcanic epoch, the basins must have had a greater degree of organization than they display in the present youthful stage of the current cycle. To say that their borders were worn down is to imply that their floors were built up with the waste derived from the eroded borders. If the basins stood at different levels the higher might have been filled up and become tributary to the lower and even the lower basins might ultimately have gained access to the sea. How far was this process carried? We know that there were interior basins in a dry climate before the volcanic epoch opened because locally developed sediments containing salt deposits are now visible on the margins of some of the existing basins. They are flexed upon the borders and thrown into low folds or faulted farther out; dissected on the borders and buried toward the center of the existing basins. These sediments are not coarse, irregular, local, alluvial-fan deposits like those that in part overlie them and that are in process of formation. They are even-bedded and extensive. They denote quieter and more gradual accumulation from an upland border well-advanced in the cycle of erosion. Furthermore, it is reasonable to infer that they overlie coarser deposits that were formed in the youthful stage of the cycle.

Whether the deposits of neighboring basins coalesced across the low divides or became at last interdependent it is not yet possible to say. It seems a fair inference, however, that they did. In even the present youthful basins there is a certain degree of coalescence of bordering waste deposits as between Quiron and Rincon (lat. 25° S). The basin of Huaitiquina now discharges into the Salar de Chanchari and the Susquez basin by the river Burras into Salar Grande. There are also a considerable number of minor basins in which the same condition has been attained. If this degree of coalescence has been gained in the youthful stage of the present cycle it is reasonable to infer that the basins had a much higher degree of organization in the mature stage of the preceding cycle. Soft forms, moderate gradients, and waste accumulation to a thickness of at least a mile on the border of the Cordillera

FIG. 8—Oasis of Toconao. Volcanoes of the Maritime Cordillera in background. One of the trails of the mountain shepherds may be seen as a white line leading from the oasis toward the mountains. Toconao is famous for its fruits and also for its good water, which is carried in pack buckets to San Pedro de Atacama, a day's journey toward the north.

FIG. 9—Temporary habitation of poles and branches on the border of the oasis of San Pedro de Atacama, used by mountain shepherds on trading journeys to the oasis.

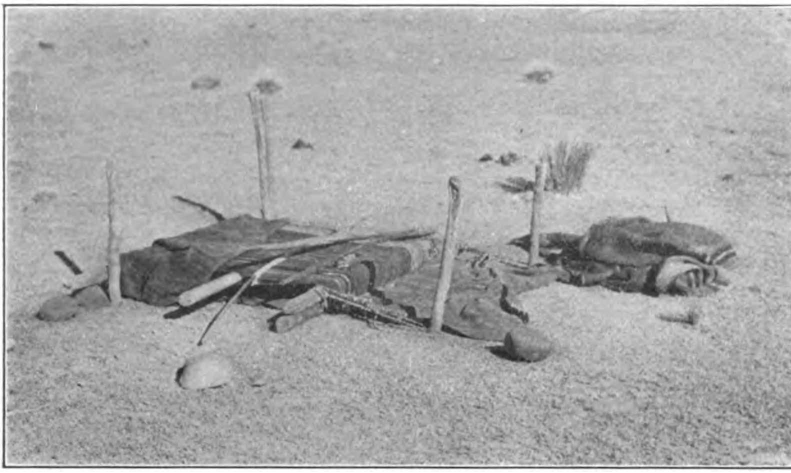


Fig. 10—Blanket weaving among the highland people.

Fig. 11—The dune country on the border of the Desert of Atacama.

were achieved during the main cycle of erosion; it must therefore be concluded that basin integration was well advanced since the leveling action of desert processes fill up basin floors and thus raise the local base levels at the same time that the basin borders are graded and reduced in height.

In the Titicaca-Poopó basin on the north we have some suggestion of the state reached by the southern group of basins. Lake Titicaca discharges into Lake Poopó through the Desaguadero river. Poopó in turn discharges intermittently into the Salar of Aullagas. Between this and a number of other large adjacent salars there is now intimate connection. Though rock masses are distributed here and there through the group of basins, they no longer form continuous divides.. They are either remnants of former more extensive ridges now partly buried, partly eroded, or volcanic masses of recent origin. In this region volcanic action was confined chiefly to the Western or Maritime Cordillera; it did not, as in the Puna de Atacama, affect the whole central basin region and obscure the earlier topography.

The light that the northern group of basins throws on the southern group is the clearer since the same stage in the erosion cycle had been reached by both. Mature forms everywhere characterize the borders of the Titicaca-Poopó basins save where volcanic material has been built upon the older surface. Long waste slopes, in complete organization with those cut upon rock, lead down by gentle gradients to the borders of the salars. Basin filling and integration are here in a advanced stage. It is conceivable that in the northern group less work had to be done to accomplish a given result. Were the basins less effectively separated from each other than those in Argentina to begin with? We can answer this question only in part. The Puna de Atacama is now a great highland with a general elevation that is quite uniform in spite of the volcanic material irregularly disposed upon it. From this I infer volcanic action to have affected less the regional elevation than the form and size of the local basins.

That the country was not built up to a general level by volcanic flows of a high degree of fluidity is shown by the fact that the older rocks, eroded to moderate gradients and marked by rounded forms, outcrop in many places and the volcanic flows are gathered rather closely about the volcanic vents. Uniformity of elevation may therefore be ascribed to moderately uniform reduction to a common level in the pre-volcanic erosion cycle. If we now consider the fine character of the earlier basin deposits it would seem

that the basins in which they were formed were more extensive than they are today. But, as we have seen, great extent and uniform elevation of basins are also characteristics of the Titicaca-Poopó region. We may therefore safely conclude that the forms and relations of the Titicaca-Poopó group of basins indicate in a general way the topographic and drainage conditions of the Puna de Atacama before volcanic material had covered a large part of the region, masked much of the older topography, and altered the size and limits of the interior basins.

The Pastoral Nomads of the Desert

The lofty Puna de Atacama lies between 23° and 26° south latitude where in June the sun's noon altitude is only 45°. Unlike the northern basin region and the Andes of Peru, the Puna has a protracted winter season marked by high winds, very low temperatures, and occasional blizzards. In our coldest camp on the night of June 22, the temperature fell to —4° F. On June 25 we rode from 4 o'clock in the morning until daybreak in a temperature that dropped steadily from +6° to 0°F. When the wind blows the cold is extremely trying inasmuch as the altitude prevents hard exercise that results in brisk circulation and a higher degree of resistance. In crossing the last pass in the Maritime Cordillera on the trail leading down to Soncor, south of San Pedro de Atacama, we rode into a wind that occasionally blew at gale strength with the temperature ranging between 7° and 45°F. In the great storm of July, 1911, a number of chinchilla hunters and cattle drivers lost their lives; and over seventy-five cattle perished at Agua Caliente (14,500 feet) on the way between the plains of Argentina and the nitrate desert of northern Chile.

Once every few years even at San Pedro de Atacama (8,000 feet) crops planted in August and September are frost-killed in December and the fields must be replanted. Though snow is a rarity in the desert it fell in 1911 down to 8,000 feet. In the oases it covered orange trees, vegetable gardens, and grain fields and effected a glory that was as novel as it was short-lived. It covered the mud huts thatched with grain-straw mixed with earth, and on melting germinated the seed, so that more than one householder grew a small crop of wheat and barley on his roof!

The extreme dryness of the region is one of its saving qualities for it limits the amount of snowfall. Were the region only a little moister the snowfall would be greater and in seasons of bitter cold the combined snow cover and low temperatures would make it not

FIG. 12—Photograph of a mirage on a sand dune, west face of El Bramador, the roaring mountain of Toledo, near Copiapó. The camera is inclined downward at an angle of 30°. The mirage shows as a slightly darker band 1/16 of an inch wide, 1⅛ inches long, and 13/16 of an inch from the bottom margin. In a good print it appears like a shallow pond on a plain of sand.

FIG. 13—A chinchilla farm on the ranch of Sir John Murray at Vallenar, Chile. The original stock of 500 has increased to 2,000. The stone mounds are artificial. A corrugated iron and wire-net fence keeps them from escaping.

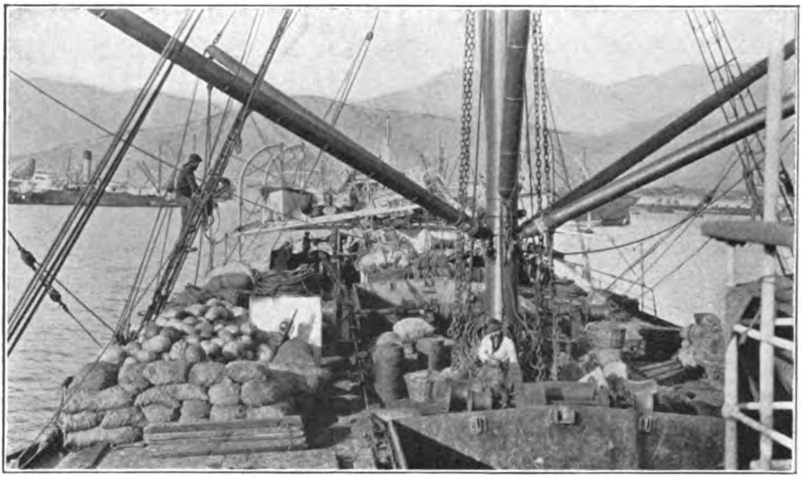


FIG. 14—Deck of the French freighter *Ville du Havre*, Lamport and Holt Line, showing vegetables in transit from the Huasco Valley to the nitrate ports. Coming south she carries vegetables to the desert ports from Arica which is supplied from the irrigated oasis of Tacna.

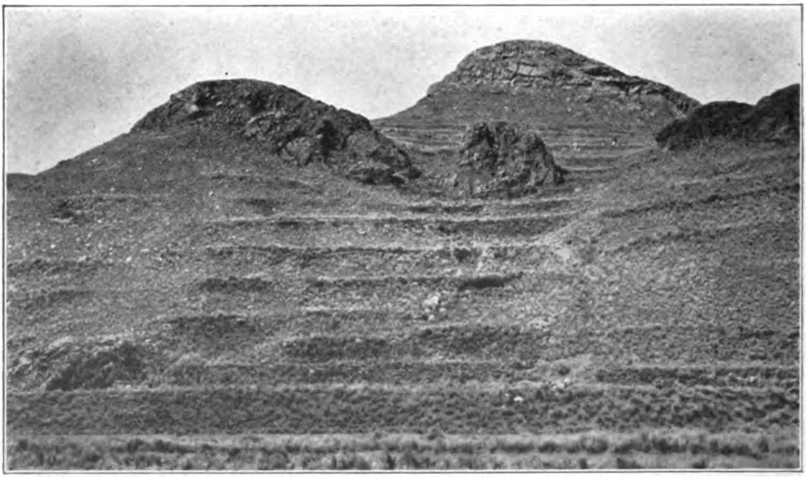


FIG. 15—Abandoned artificial terraces, called *andenes*, in the Cayrani Valley, a day's journey west of Puno, Lake Titicaca. Here once lived a much denser population, but the decrease is not due to a change in the productivity of the land or to a diminished rainfall. The population was drawn off in earlier years to the silver mines nearby and in later years to the towns and to the estates of the landed proprietors.

Fig. 16—Ancient chullpa in the Desaguadero Valley near Fairweather Gap. The thin partings represent layers of tough grass, bent back on the inside toward the outer face so as to give a smooth interior. The top is flat on the outside but dome-shaped inside. Under the floor are the skeletons of the former inhabitants. The door is about six feet high. The chullpa dwellings are no longer inhabited.

Fig. 17—Petroglyph near San Pedro de Atacama, exhibiting a chinchilla skin and llamas cut into sandstone.

FIG. 18—Petroglyph in the making, near Piedra Blanca, west of La Poma, elevation 13,000 feet. The outlines of llamas may be clearly seen; likewise the zigzag pattern of a snake as well as symbols whose meaning is not clear. The notebook is eight inches long.

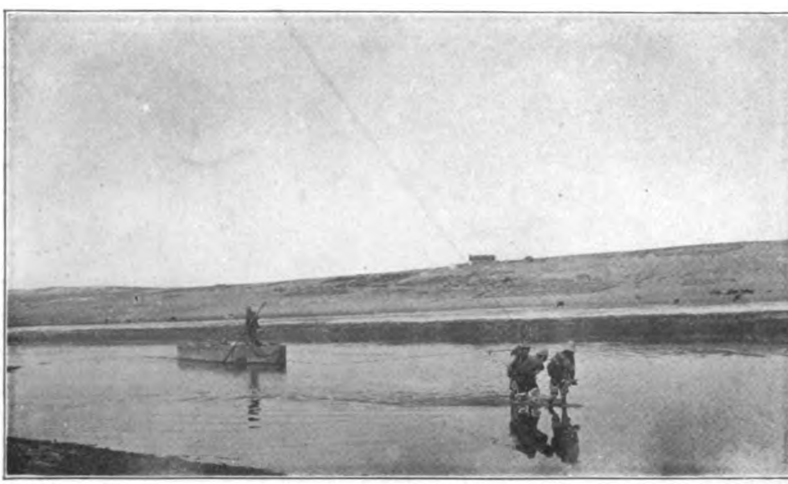


FIG. 19—Indians towing the Expedition's flat-bottomed, shallow-draught boat, below the limit of steamer navigation, Desaguadero River.

only uninhabitable but also untraversable. Except for intervals of a few weeks in times of storm, mails are carried across the mountains by "mule express" in six days and nights between La Poma in the Argentine and San Pedro de Atacama in Chile. No mail whatever could be carried if the snow cover were of notably longer duration.

Instead of the fixed climatic conditions of the trade-wind belt in the northern Central Andes we have here a zone where alternately trades and horse-latitudes hold sway. The balmy days of "El Verano de San Juan" in June or the calm weather of a few weeks in summer are rare exceptions. More common are the high and bitter winds of winter that drive the traveler to sheltering angles in the canyon wall or behind every stone large enough to protect his body. In summer the wind raises great clouds of dust which are almost as fatiguing as the low temperatures of winter.

One of the most important results of the dry Puna climate is the great distance between springs and streams, commonly 30 to 40 miles. Where seepage water from a large area gathers on a valley floor of limited extent useful grass may grow, but in the great expanses between seepage lines and springs there are only useless shrubs and ground moss. In the northern Central Andes, every part of a mountain valley yields something useful to farmer or shepherd. In the Puna there are no pastures on the loftier pampas. Only from 11,000-13,000 feet where clouds gather in winter and where summer rains are most frequent is there a belt of pasture, called *pajonal*—delicate green in summer and light yellow in winter—that may be seen from far across the bordering desert on the west. Below this belt, as above it, there is nothing of value to farmer or shepherd except where some mountain stream sinks into the coarse alluvium of the piedmont plain. When the shepherd is driven from the upper *pajonales* he has little choice of places to go. The desert oases may be crowded but there his flock must ultimately be driven. The sole though temporary alternative is to seek out the neglected spots where tiny springs water a narrow ribbon of green. There his flock flits from one clump of shrubbery to another or gathers in greedy rings about rare hummocks of grass.

The mountain shepherds are stunted in mental development by the harsh climate and slender resources of their cold valleys and high pampas. Otherwise we might expect an armed contest for food between the oasis dweller and the mountain shepherd. Actually we find that there is the closest and friendliest relation. The causes for this condition lie not only in the mentality of the Indian;

it lies also in the geographic distribution of his principal natural resources. The oases on the western border of the Cordillera are for the most part mere dots in a vast desert. Miles of almost naked lava separate them from the belt of mountain pastures. Miles of hot sandy piedmont separate them from each other. In the absolute desert about them their own flocks, had they any, would find subsistence for only a part of the year. Hence the small size and scattered distribution of the oases make them quite as dependent on the flocks of the shepherds as the shepherds are dependent upon the vegetable food of the oases. Indeed, this supplementary relation is carried so far in the case of the smaller oases that they are merely the winter camps for the mountain shepherds who have their own gardens which they leave to the care of the old and infirm during the greater part of the year. At Tilamonte a few patches of land are planted, then left to the care of wind and sun until the harvest is due. Above Toconao the villagers each year go up to a line of tiny springs to cultivate a few additional acres. Almost the whole population of Soncor and Socaire are in the mountains in summer, leaving windows and doors barred and gardens cared for by the feeble who are left behind.

Along the line of a single valley like beads upon a string are the scattered plots of precious watered land. Between them there may be nothing but gravel-strewn stretches of valley flat. Hence it is natural that each cultivated tract should be known under a different name and give its name to a part of the valley. The best illustration is to be found in the valley of Rio Atacama. The town of San Pedro de Atacama has about 500 people but all about it (and to the inexperienced traveler they appear a part of it) are scattered groups of families and little villages. All told they raise the population of the district to 2,000. On the maps the name of San Pedro de Atacama is applied to the whole collection of groups. Among the Indians each group has a distinct name and even the central part is not called San Pedro but *Conde Duque*. For two leagues above this nucleus are small cultivated tracts, Cuchaloache, Catarpe, Tambillo, Silo, and Quito where fruit is grown. Extending to a point three or four leagues below are Sólar, Larache, Yaye, Pácsar, Chécar, Séquitor, Coyo, Tulur, Beter, Poconche, Solcór and Cúcuter on a ridge of sand, and Tevinguicha on the border of a brackish swamp due to seepage from the piedmont deposits. Each village represents some natural advantage. Here a group of algarrobo trees feed on the ground water and supply an abundance of

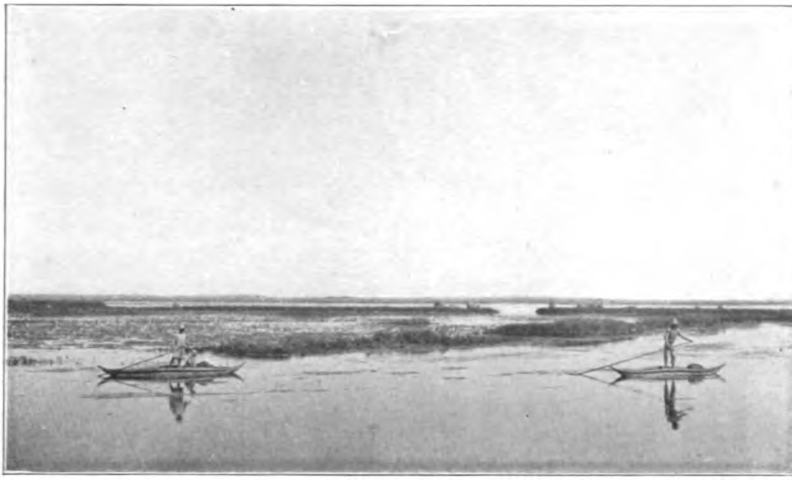


FIG. 20—Uros Indians in reed boats in the Totoral or great Desaguadero reed swamp, south of Lake Titicaca. The boats are propelled with long, slender poles brought from the forests on the eastern border of the Andes.

FIG. 21—Cattle feeding on the green, succulent water grasses in El Totoral swamp, Desaguadero Valley.

Fig. 22—Uros Indian woman grinding millet in a goatskin. The grinding stone has been brought from a rock outcrop several miles away. The sack contains llama dung, called *taquia*, and used as fuel. The reed thatch of the mud hut is secured by grass ropes fastened to pegs in the wall.

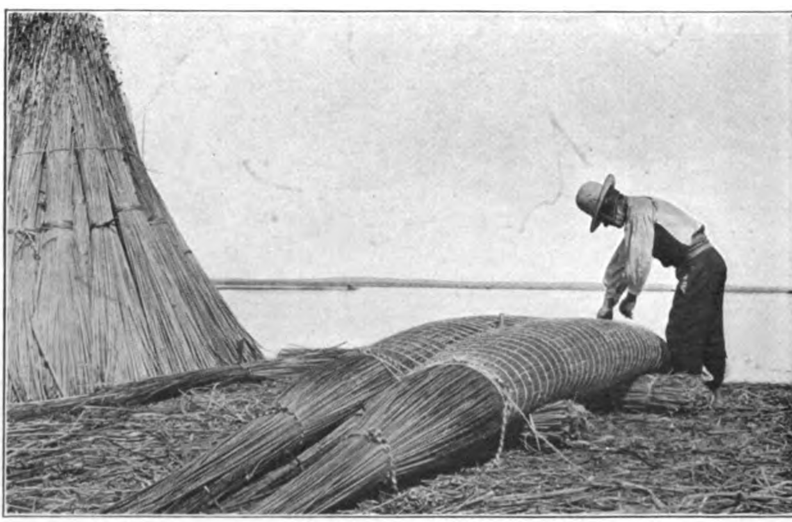


Fig. 23—Uros Indian making a reed canoe on the border of the great reed swamp of the Desaguadero, fifteen miles south of Lake Titicaca. The rope with which he is binding the reed bundle is made of grass. Note the cattle far out in the swamp in the background.

algarroba fruit. There a clump of chañar trees supplies nuts for the delectable chañar meal. On the edge of the swamp of Tevinguiche is pasture to be rented to the cattle drivers from across the Sierra. The soil is sandy at Cúcuter but it also has no harmful salts and if watered but twice a year yields good crops. At Catarpe are warm terraces easy to irrigate, hence beautiful fruit orchards.

San Pedro de Atacama is a city of arrieros (muleteers). Unlike its tiny neighbors it draws upon outside resources. The additional population which it supports requires food in amounts greater than the land can yield. Its wants are more varied. Through it also flows a commerce between the mountain peoples and the outside world. At San Pedro we should therefore expect trading customs and movement of population quite distinct from the feeble movements between the tiny oases. From their valley homes and upland pastures the shepherds come for the supplies of chuña, chañar, dried fruit, wheat, and flour. Their dependence on the town is so great that in many cases they construct two huts, one at the home oasis in a quebrada miles away; another in the desert on the border of the gardens that surround San Pedro. They pasture their flocks on grasses and shrubs nearby, rest a few days, trade, and return. A few have even gone so far as to construct a third hut on some neglected patch of land at the common border of desert and irrigated land and there plant a few grains and seeds to help out their slender resources. Among the oasis products are a few which they have grown very fond of—chañar, for example. In very dry seasons the crop may be small and the owners unwilling to part with it. Then the nomads refuse to sell their ropes of twisted llama wool. Now the arrieros of the town must have these to hobble their beasts at night while on a journey across the desert. Leather thongs would chafe the legs of the mules and start troublesome sores. Moreover, they cannot be so securely tied and the security of one's beasts is a most important care in desert travel. If the shepherd will not sell his valuable llama wool ropes for money the arriero must exchange for them something of less value to him. Thus he reluctantly parts with his crop of chañar nuts, for which he may substitute wheat, rather than do without the wool ropes for which he has no substitute.

In the communal vicuña hunts, now of great antiquity, these pastoral nomads on the western flanks of the Andean Cordillera show most clearly their isolated condition. Elsewhere the ancient customs have largely disappeared. The priest has substituted the ceremonies of the Christian church for the old feasts of the harvest

and the chase. But the poor shepherds of the desolate country on the mountain border of Atacama still retain their old ways. Some of them are in pure form; even those that have become modified still have a strong flavor of the original paganism. Among them the vicuña hunt is by far the most interesting. Late in February or early in March, four or five days after the carnival of Chaya, the men of Aguas Blancas and Toconao go into the mountain country in search of vicuña. On the fifteenth day after the carnival the villages are almost depopulated. The women are busy stringing threads across the valleys down which the animals are to be driven for the vicuña will not pass a thread or rope stretched across his path. The men scatter widely in order to keep the quarry in the ravines. The hunters are mounted and when the vicuña become confused and huddled they are easily shot. He who kills a vicuña gets the skin, the most valuable part. Thus there is a strong incentive to compete in achieving the hardest part of the hunt. The rest of the animal is common property; since the hunt is cooperative all must share in some way in the spoils.

Of equal interest are the people of Antofagasta de la Sierra. In that small village on the floor of a canyon, remote and almost inaccessible in winter, live a group of shepherds that have but feebly responded to the movements of population and commerce about them. In the last hundred years they have belonged in turn to Bolivia, Chile and Argentina, without realizing the change. At last, title to their disputed territory passed definitely into the hands of Argentina. When the government made itself known they petitioned to be allowed to live on the land without the trouble of securing documentary titles and with all their ancient rights intact.

The degree to which pastoral conditions have guided the form which many customs have taken is perhaps best shown in the most important social relations of the people. It is not a disgrace for an unmarried girl to give birth to a child, or even three or four children, before marriage. On the contrary, it is a distinct advantage. Even small children, four to six years old, may guard large flocks of sheep. Hence the larger the number of children a woman can bring to her marriage feast the better pleased her husband will be. The children are therefore an asset; they constitute their mother's *dot*. Nor need they all have the same father. In short what would seem to us to be gross immorality is here regarded as a virtue though perhaps less because of any clear ideas of virtue than on account of a low stage of development and the practical

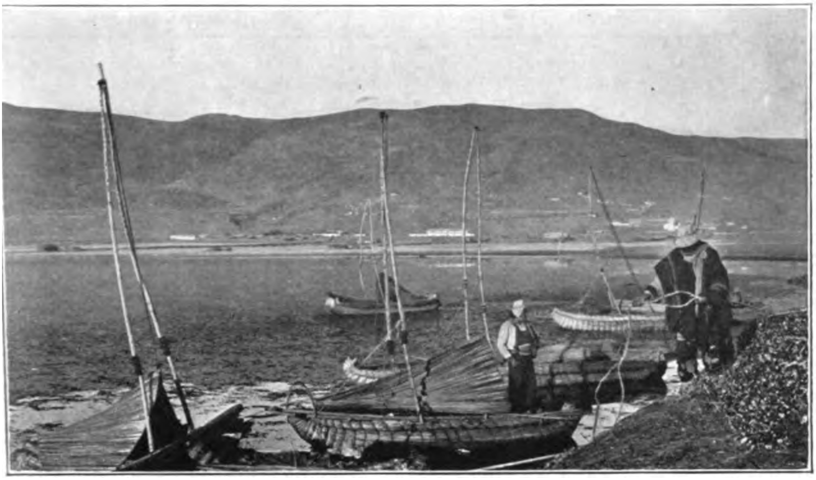


Fig. 24—Reed boats on Lake Titicaca. The thicker construction, as contrasted with the long slender lines of the Desaguadero boats, reflects the stormier nature of Lake Titicaca. The strongly upturned bow and stern enable the canoe to rise over waves of considerable height. The boats make so much leeway that they are sailed chiefly down the wind. These traders have been waiting two days for a favorable offshore breeze.

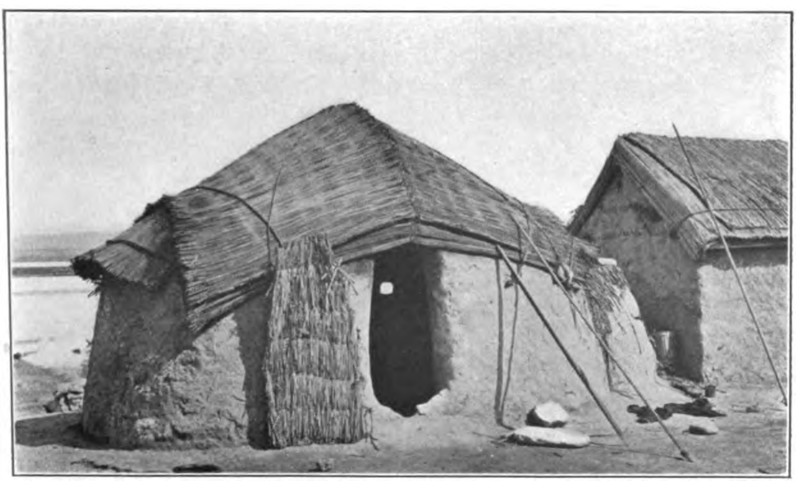


Fig. 25—Reed-thatched mud huts of the Uros Indians at Ancoaqui, Desaguadero Valley. The house on the left is a distinctive type with rounded corners and a mansard roof, adapted to the length of the reeds and the rounded walls.

FIG. 26—Chaco cattle in the Desert of Atacama, after a twelve days' journey across the Cordillera between Salta, Argentina, and San Pedro de Atacama, Chile.

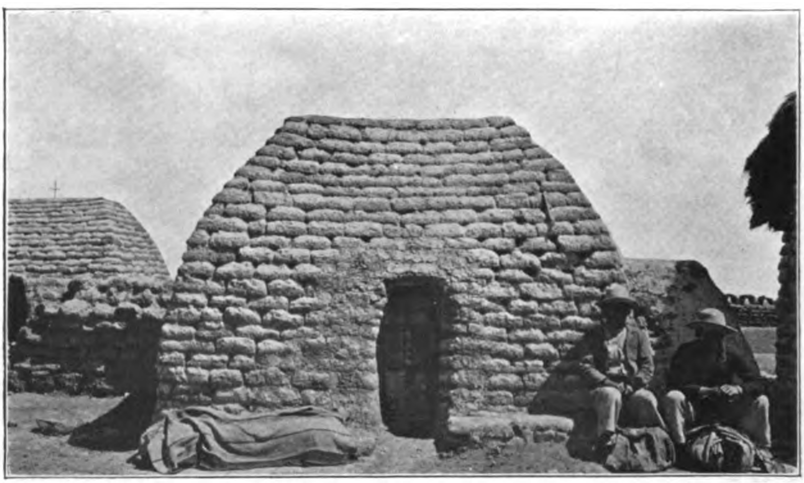


FIG. 27—Sod huts at Titipata, Desaguadero Valley. The thick-rooted, short grasses make a turf which has resulted in a different type of building material from that used elsewhere. This style of roof, adopted by people remote from forests, also avoids the use of rafters and ridge pole.

relation the custom bears to the business of securing a living under extremely hard conditions.

The Transition Belt of Copiapó

Southward from the almost rainless Desert of Atacama, in Chile, there extends a belt of country in which light, uncertain rains occur. The farther south one goes, the more frequent become the showers until in the latitude of Santiago they yield rain sufficient for agriculture, though it is only when we reach the Maule Valley 150 miles farther south that the amount exceeds 30 inches a year. In the Copiapó Valley the average is about two or three showers a year. In the Huasco Valley, one hundred miles south, there are twice as many showers and three times as much rainfall. This is then the transition belt between horse latitudes and westerlies where we find great variability in rainfall and in life conditions in places only a few degrees apart.

Ever since reading Darwin's famous description of them I have been eager to visit the valleys of the transition belt and gain some idea of the effect of the variable rains upon the life of the people. The study of the Tarapacá desert in northern Chile (1907) greatly increased my desire to visit the more southern valleys, and this at last became possible in July, 1913. Fortunately from the standpoint of geographic study, the region had suffered for several years from one of the most severe droughts in its history. On every hand I heard with what difficulty enough water was secured to keep the alfalfa meadows from drying up and the cattle from starvation.

Though there is more water at Vallenar, in the Huasco Valley 100 miles south of Copiapó, the same complaints were made there. It was predicted that rain would surely fall, because no rain had fallen for three years in succession. One day great masses of black clouds came rolling up from the south, rain was confidently predicted, and telegrams were sent to absent owners at Santiago. It was a novel experience to find water so important there that messages are sent whenever it looks as if it *might* rain! But the clouds dissolved in the late afternoon and I was disappointed on leaving to have missed a rainstorm in famous old Vallenar. At the suggestion of one of my hosts I left my future address, so that he might telegraph me news of the first rain.

A single heavy shower benefits pastures and fields and brightens the outlook of hundreds of people. Two showers bring a year of plenty, and three or more showers make the year memorable, if

indeed they do not bring floods and greater disaster than several years of drought. Eight years ago there were extraordinary floods at Vallenar; fertile fields were covered with coarse gravel; landmarks were swept away; and large tracts of land on the valley floor had to be not only reapportioned, but resurveyed. Tierra Amarilla, a village a few miles above Copiapó, was wholly undermined and the houses carried off in the flood of 1906.

The rivers of this whole region commonly do not reach the sea as a surface flow. They terminate in the alluvium that chokes their lower valley stretches and thus effect a subterranean discharge. Their normal condition is modified in years of high water. The rivers are then extended to the shore and great masses of waste are swept out into the ocean. Thus in 1888 the Copiapó River reached the sea, whereas now it terminates many miles inland in a salt-incrusted flat overgrown with low, gnarly shrubs and coarse grasses. The Rio Algarrobal (latitude 28° S.) last reached the sea in 1906. For years it had terminated above the pueblo Algarrobal, but in the four wet seasons succeeding 1902 it flowed to the end of its valley. Thus we have here, in the horse-latitude belt near the border of the westerlies, a type of drainage distinct from (1) that in the still drier north where the mountain streams terminate on the land, and (2) that in the wetter south where the streams always reach the sea.

The two elements of greatest importance in the study of the relation of the people to water supply in this border region are the local showers and the distant mountain snows. The showers are nature's gift to poor and rich alike; the snows, melting, discharge by way of rivers, and river water can be used only by the landowner who lives on the valley floor. Furthermore, the larger the estate the more water it is entitled to use, hence a greater disparity between the financial condition of the small and the large landowners in years of low water. The resources of the rich enable them to weather the temporary difficulties which years of drought inevitably bring. By contrast, the poor landowner may be forced to sell his farm and stock at just the time when they bring least. To him the droughts may mean not only distress but ruin.

In earlier years when there was a purely local market for farm products the rains were not an unmixed blessing. The owners of hired troops of mules, the cattle importer, the miner, were all benefited, since their stock found free forage. But the landowner who made a business of renting pasture or selling hay found his income reduced, because the lower prices of wetter years more

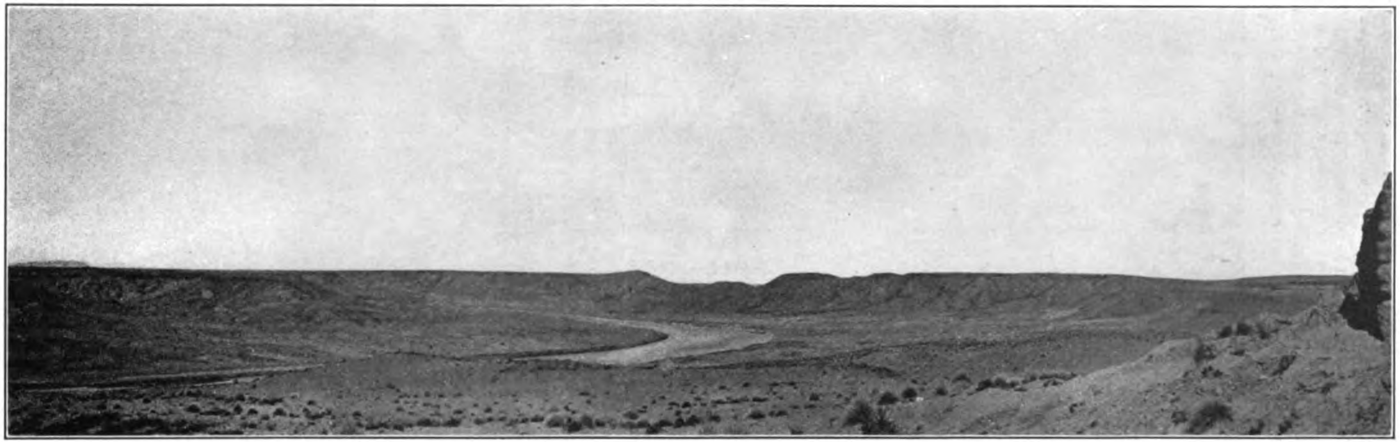


Fig. 28—Looking down (south) the Desaguadero Valley at Fairweather Gap (center). In the bluff on the extreme right (foreground) are stratified sands and clays, the deposits of Lake Ballivian. At their level in the right background are similar beds thinning out toward the skyline. The same beds in similar relations may be seen in the left background. The older sedimentary deposits on which they rest dip strongly toward the left (east). They are in part of Cretaceous age, in part Permian, and were beveled off to form a local peneplain before the deposition of the lake beds. (See Figs. 29-33.)

FIG. 29—Looking east across Fairweather Gap. In the background, extreme left, the deposits of Lake Ballivian rest like a thin wedge upon the inclined sediments that outcrop on the opposite side of the Gap and dip away from the observer (east). The hill on which the camera stands is 210 feet above the Desaguadero River, which may be identified easily. The river is here 46 feet below Lake Titicaca. The difference, about 160 feet, represents the elevation of Lake Ballivian above Lake Titicaca.

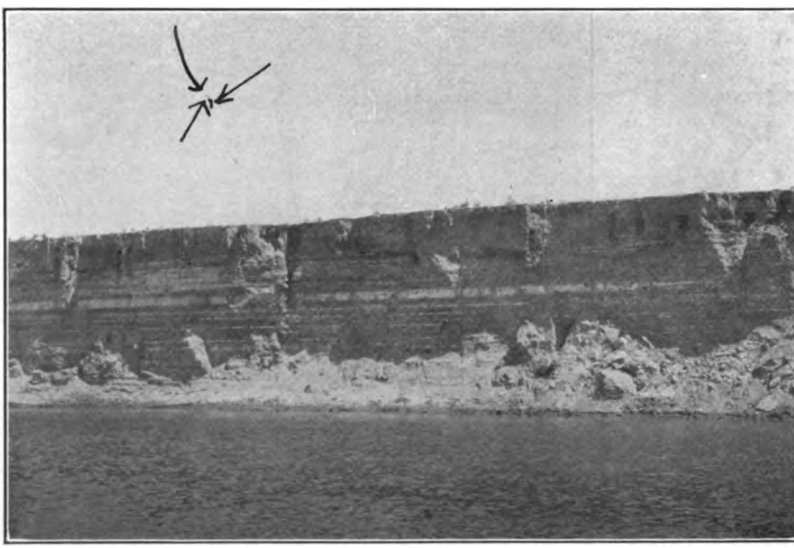


FIG. 30—Finely laminated clays, silts, and sands of Lake Minchin above (north) Fairweather Gap. Their visible portion is here 30 feet thick and in places have as high as 15 to 30 thin, and about 7 thicker laminations to the inch. They are in strong contrast to the thick-bedded deposits of Lake Ballivian. They lie only on the valley floor, whereas the deposits of Lake Ballivian are now in most places eroded back some distance from the river.

than offset the greater product. Since the prices of all merchandise were, in the pre-railroad days (before 1851), largely controlled by the rate of transport from the coast ports, and this in turn by the abundance of free pasture and the price of hay, the wet years always carried the advantage of cheaper goods, and this advantage was shared by all. Those who had forage to sell, therefore, gained most in years of moderate dryness, when there was neither free pasture nor abundance of water for irrigation.

At the present time the nitrate industry alters this condition. Its steady demand upon the alfalfa meadows for the thousands of mules that are required for the caliche carts maintains the prices at a higher level, and many years of rain are now marked by a much higher level of prosperity for the landed proprietors. This in turn helps the poor laborer, the vagrant shepherd, and the small landowner who in former times was often pushed to the wall. Life has therefore become easier and safer; the former waste in years of rain and distress in years of drought has been displaced by organized commerce in response to the steady market in the nitrate desert. But the people have not in any sense lessened their dependence upon the rains. In fact, they have greatly increased it. A new industry and the general organization of commerce in which the railroad plays a large part have merely turned their dependence into new channels.

In the wet years, imported cattle from Argentina winter in the hills and are driven down to the valleys ready for the market. In dry years they arrive lean and weak after their long journey across the lofty desert mountains, and must be fed on rented pasture in the alfalfa meadows of the valley people. When dry years occur in succession the prices of forage may rise faster than the prices of meat, since the owner's draught animals are his first care. As a result the drovers stop their importations, for with rising prices the small buyer who is continually becoming poorer at last is unable to buy meat at all. If the dry period continues, mules may be driven from Chile into Argentina, there to winter on cheaper pasture until the return of normal conditions in the desert.

Formerly the mining industry absorbed not only the chief part of men's energies in the Copiapó region, but also most of the products. Cattle were then imported from Argentina for the mines, just as they are now imported for both the mines and the nitrate fields farther north. Great troops of hired mules were employed by the mine owners to carry copper and silver ores to

the coast ports. Both mules and cattle had to find subsistence in part on the desert upland where short grasses spring up after the winter rains. In the history of the mines there are many instances of distress owing to the poor state of the pastures. Exploring expeditions were early sent out to discover new routes along valleys where showers had been reported by travelers, and in at least one instance a new route led to the development of a new port as short-lived as the pastures to which it owed its origin. When a period of dry years set in all transportation had to be stopped, the ore accumulated at the mines, and chartered ships were sent back to Swansea either empty or half loaded. Thus dividends were passed more than once at London because of the lack of a few showers in Chile.

When the alfalfa fields dry up and neighbors are in sharp rivalry over water diversion the old colonial rule of the "turno" is enforced. A commission is selected with power to enforce water regulations. These require that only once every fourteen days may a landowner divert water to his fields and then in proportion to their size. But it is impossible to police the whole valley from the Cordillera to the town. Each landowner must therefore be to some extent his own commissioner and detect and punish unlawful diversion. Feuds arise and grow the more bitter because the valley is restricted in population and families are intimately related by village or social groups scattered up and down the valley. The quarrel of one thus becomes the quarrel of the group to which he belongs.

Said the manager of one of the mining companies at Copiapó in 1838: "It would be difficult for anyone who has not experienced it to believe in the robbery and quarreling constantly on foot with respect to rations of water in this extraordinary and desert district, along the whole course of the valley from the town to the Cordillera, a distance of ninety miles—all the lands being dependent for irrigation upon a little contemptible stream of water whose volume at any one point is barely sufficient to fill the wear of an ordinary flour mill.

"Notwithstanding the regulations that have been made by the authorities—and heavy fines imposed on infringements—such are the difficulties of proof and such the localities of the district that abuses can be practiced with impunity. . . ."

On more than one occasion I got myself into an embarrassing position on account of seemingly harmless questions about water rights. I soon found that a social guide was needed—one who could tell me who were friends and who were enemies. At times

it was necessary to exercise great care in receiving various officials and townspeople who were kind enough to call upon me, lest there should be formed an uncongenial group. It would be difficult for A to join B in polite explanations when A's servant had but lately broken B's servant's head. B would not feel nearly so badly about the broken head as about the alfalfa field that would now be ruined on account of the sudden interruption in the process of stealing water from his neighbor's canal. It was pointed out to me that the Decalogue does not include water among the things that shall not be coveted, hence water diversion from a neighbor's ditch at three o'clock in the morning seems to the drought-stricken farmer to resemble theft less than intense business rivalry.

But there is a happier aspect to the picture. With what enthusiam a desert dweller still speaks of the years of abundance—when the rains came, and there was plenty for all. The influence of the seasons on the valley people is as marked as ever. In spite of a railroad, a higher degree of organization, and a position on one of the routes of world commerce, they find the rains a matter of deepest concern. When showers come cattle are driven to the free upland pastures. Between 1890 and 1892 the valley stock was sent into the hills, the owners lived in tents like true nomads, and in the plenty of those years forgot long-standing quarrels over water rights. The earth is then no longer a desert waste. Where sand and tough shrubs ordinarily hold sway there is now wild clover, knee-deep, luxurious. The erstwhile niggardly earth yields an abundance of food, as if suddenly awakened to generosity of its own free will—*sponte sua*, as Horace says. Flowers bedeck the light-green upland meadows. It is a year of rain!

Now that the nitrate fields are in a high state of development and in chronic need of laborers, the dry years in the southern valleys are times of migration to the northern desert. There they remain until they hear from relatives and friends that rains have brought plenty, whereupon they drift back to old occupations—the transport of merchandise by pack train, the cattle business, the production of alfalfa, or a host of minor projects which general prosperity encourages, if it does not create, and which general distress forces people to abandon.

The Lake System of the Bolivian Plateau

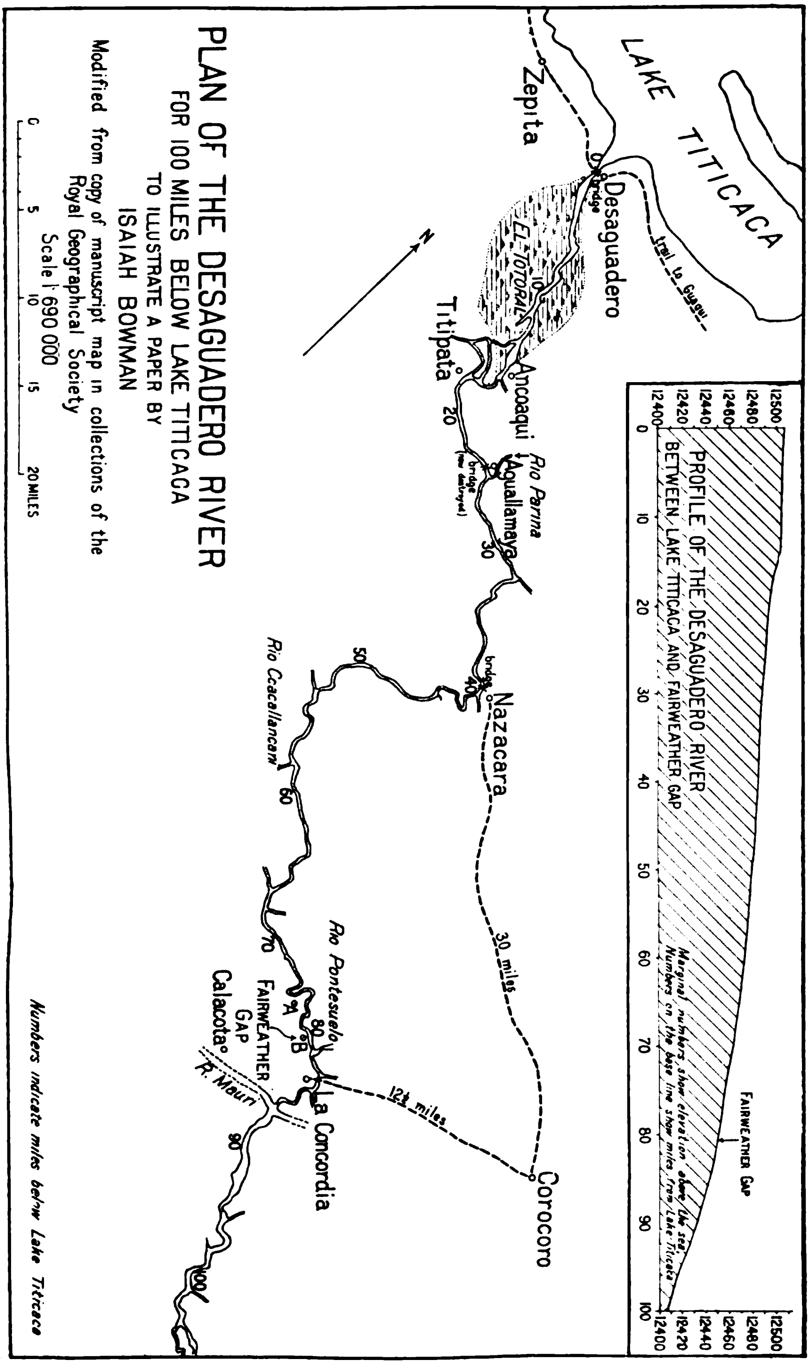
The work of the 1913 expedition in western Bolivia was confined to the solution of a problem that has long puzzled students of geography—the history and relations of the system of plateau

lakes. Three distinct water bodies were formed in the Titicaca-Poopó basins, whereas in the past both shore forms and bottom deposits of the great depression in the tableland have been considered to be the products of a single water body whose shrunken remnants are the Titicaca and Poopó of to-day. The full discussion of the details with references to earlier views will be left to a later paper. It is sufficient here to outline the conclusions and the main facts on which they rest.

In 1907 I entered Bolivia from Chile via the Cueva Negra pass in the Cordillera Sillilica and found, on the western border of the Poopó basin, strand-lines of a vanished lake. This lake I propose to call Lake Minchin, after the late Juan B. Minchin of Oruro, whose studies of forty years ago mark the beginnings of our scientific knowledge of the Bolivian basins. Though I had only aneroid measurements of the elevations of its shores, it seemed incredible that the lake should ever have been several hundred feet higher than Lake Titicaca, as some have supposed. The old shorelines of the lake are also clearly visible on the Cerro de Oruro as at many other places, and everywhere they seem to be horizontal and below the level of Titicaca. The problem of the relation of Lake Minchin to Lake Titicaca is complicated by the presence of lake deposits at a few points about the border of the Titicaca depression. It was adding confusion to complexity when certain students began to assume that the widely scattered deposits of a still earlier lake system were part of a great series made in a single lake of gradually diminishing size. Such a conclusion identified as one not only lakes in different basins, but also lakes belonging to distinct geologic epochs and possibly even to distinct periods.

From brief studies at various points on the border of the Titicaca-Poopó basin I reached the conclusion that the Desaguadero Valley held the facts most necessary for a correct solution. A short visit in 1907 to the head of the Desaguadero Valley resulted in a few new data, but left the most important part of the problem unsolved. I therefore made arrangements in 1913 to descend the Desaguadero, if need be to Lake Poopó, and to get critical evidence bearing on the succession of lakes and their relations. Happily, the necessary relations were encountered about eighty miles below Lake Titicaca, with the following results:

Lake Minchin—a temporary lake of glacial times—extended up the Desaguadero Valley beyond Concordia to a point about thirty miles south of Lake Titicaca and thence southward over the whole Poopó basin. Finely laminated clays lie on the floor of the



LAKE TITICACA
Trail to Guaqui
Zepita
Desaguadero
bridge
EL TOTORAL
N
Titipata
Ancoaqui
Rio Parina
Aguallamaya
bridge (now destroyed)
Nazacara
bridge
Rio Ccacallancani
Rio Pontesuelo
30 miles
FAIRWEATHER GAP
Calacota
R. Mauri
La Concordia
12½ miles
Corocoro
PLAN OF THE DESAGUADERO RIVER
FOR 100 MILES BELOW LAKE TITICACA
TO ILLUSTRATE A PAPER BY
ISAIAH BOWMAN
Modified from copy of manuscript map in collections of the Royal Geographical Society
Scale 1:690 000
20 MILES
Numbers indicate miles below Lake Titicaca
PROFILE OF THE DESAGUADERO RIVER
BETWEEN LAKE TITICACA AND FAIRWEATHER GAP
Marginal numbers show elevation above the sea.
Numbers on the base line show miles from Lake Titicaca
FAIRWEATHER GAP
12500
12480
12460
12440
12420
12400

valley and are interpreted as bottom deposits. They indicate that Lake Minchin stood from thirty to forty feet below the present level of Lake Titacaca. Their elevation coincides remarkably well with the highest strand-line at Oruro, 125 miles to the southeast, and the elevation of the shorelines at Llica toward the Chilean frontier, 200 miles south. It thus seems established that Lake Minchin never reached Lake Titicaca. The bearing of this fact may be appreciated from the statement that it was to the coalescence of these lakes and their former greater elevation that students formerly ascribed the assumed higher strands of Lake Titicaca.

This conclusion was rather clearly forecast, though by no means established, by the work of 1907. The climax of the present study was the interpretation of the relations of both Lake Minchin and Lake Titicaca to a third lake which I propose to call Lake Ballivian, in honor of Don Manuel Vicente Ballivian, Bolivia's most distinguished scholar. At various points about the borders of Lake Titicaca and from fifty to one hundred feet above it there have been found in past years clay deposits containing shells similar to those now inhabiting the shore of the lake. But the deposits are of small extent and have associated with them no shore terraces or beach deposits that would make clear their origin. In the examination of clay outcrops in quebrada Carabaya, back of Guaqui, and in the hills at Tiahuanaco I found shells and reed impressions similar to those on the existing shore. They occur up to 125 feet above the lake and appear to be in a late stage of erosion, since they occur in scattered remnants and their associated shores have since been completely eroded away.

At the southern end of the Totoral, a great swamp in the Desaguadero Valley just below the outlet of Titicaca, there is a little village of Uros Indians. The houses are built at the top of a low bluff on whose face there outcrops a white marl containing identically the same shells. The elevation is only a few feet above Lake Titicaca. The farther down the Desaguadero one goes the higher these marly deposits lie, until at Nazacara they outcrop 100 feet above the river. They also become interstratified with sand, silt, and brown clays. The latter group of deposits increase in thickness down valley and, ten miles above La Concordia, they terminate on the slopes of a broad ridge which crosses the valley. At the point of termination they are 210 feet above the Desaguadero and 160 feet above Lake Titicaca. These measurements are based on both hand leveling and aneroid determinations with the river as a base. The river gradients and the exact elevations at every

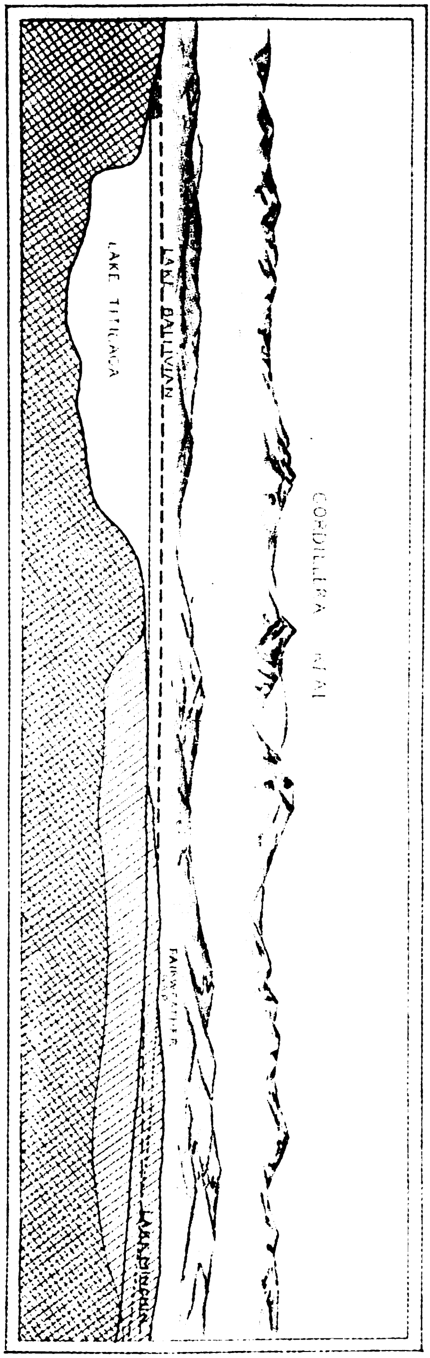


FIG. 32—Diagrammatic sketch of the lake system in the Titicaca-Poopó depression. The profiles of Titicaca and the Desaguadero are drawn to scale; likewise the various lake levels; but the Cordillera Real and the intervening smooth-contoured range are sketched only in the most general way. Looking east. (For details at Fairweather Gap, see Fig. 33; see also Figs. 28 and 29.)

point we were able to secure from a manuscript map made by engineers of the Peruvian Corporation. This had been deposited with the Royal Geographical Society, and to their courtesy in allowing a copy to be made we owe more than we can here express.

Dr. G. H. Dall of Washington has identified some of the shells from Ancoaqui as probably early Pleistocene. For our present purpose their precise age is not a matter of great importance. The points of chief interest are: (1) They are the deposits of a lake that once stood 150 feet above Lake Titicaca; (2) the outlet of the lake in which they were deposited was cut down and the deposits themselves deeply and widely eroded before the last glacial epoch of the Central Andes began; and (3) deposits of glacial Lake Minchin lie on the floor of the Desaguadero Valley cut into the beds of the earlier lake. The outlet of Lake Ballivian is now a gap in the hills above La Concordia (Figs. 28 and 29). To it I have applied the name "Fairweather Gap," after F. W. Fairweather of Guaqui, to whom I owe a heavy debt of gratitude for assistance in transportation and for his interest in the problems of the Desaguadero Valley. The chief relations of the three lakes, their deposits and outlets, are shown in the accompanying photographs and sketches. A full discussion will appear in a later number of the *Bulletin*.

A journey about Lake Titicaca, with frequent stops for the examination of apparently critical localities, leaves me still in doubt as to certain important chapters in the history of the basin. In many places one cannot find remnants of the clays of Lake Ballivian in protected places where they would be most likely to survive. Furthermore, the clays and marls of the Desaguadero Valley are unequal in height, though their inequality seems to be confined to the vicinity of Lake Titicaca. In the middle stretches between Fairweather Gap and Ancoaqui they appear to be horizontal. These facts are scarcely more than hints that the Titicaca region may have been subject to deformation at the end of an early lake period and that through this deformation it gained its present attitude, which it has kept through a cycle of erosion so prolonged as to soften its tributary slopes and all but remove former shore terraces and border deposits.

The numerous shore lines to which Agassiz referred in 1879 do not exist. Lake Titicaca has stood at or near its present level ever since the period in which its outlet cut down Fairweather Gap to about its present level. That it has long been at this elevation is shown by the fact that it has suffered no significant change

of level during both the glacial and postglacial periods. Fifty-five miles below Lake Titicaca the deposits of glacial Lake Minchin still remain, but slightly eroded, on the floor of the Desaguadero Valley. Compared with Lake Minchin, Lake Ballivian is old and was the product of a stage of deformation intermediate between that which

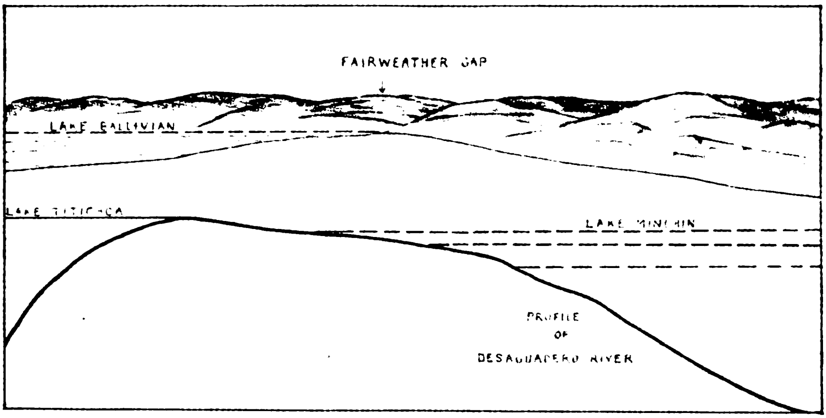


Fig. 33—Sketch showing relations of lake levels at Fairweather Gap. Fig. 32 is too small to show these relations accurately. Lake Minchin—a temporary lake of glacial times—came into existence long after the Desguadero had cut down its valley from the level of Lake Ballivian to that of Titicaca.

defined the great central basin region of Bolivia and that which gave the land its present attitude.

It is an interesting consequence of the above conclusion that the great salt deposits of the salinas west and south of Lake Poopó are not alone the accumulations of the Titicaca discharge or of temporary Lake Minchin of glacial times. They represent also the accumulations of that long period when Lake Ballivian discharged south through Fairweather Gap, a period of time possibly several thousand times longer than that representing the duration of Lake Minchin.

STEFANSSON'S EXPEDITION

The following letter from Mr. Vilhjalmur Stefansson, dated Point Barrow, Alaska, Oct. 31, 1913, has been received by our Society. It contains the first detailed statement of the plans for exploration he had formulated before the drifting away of the *Karluk*. This statement is of much importance, as Mr. Stefansson hopes still to carry out practically his programme of work and that with the collaboration of the *Karluk*. He outlines his modification of and additions to his working plans during the period before the opening of navigation next summer rendered necessary by recent events; and discusses the experience of other vessels caught in the ice as the *Karluk* was in the Point Barrow region, drawing inferences as to the prospects of the *Karluk* under various circumstances. Mr. Stefansson writes:

"Hitherto I have not been able to prepare for publication a statement of the organization, plans and fortunes of our expedition to this time. The leading facts may be of interest, and I here present them.

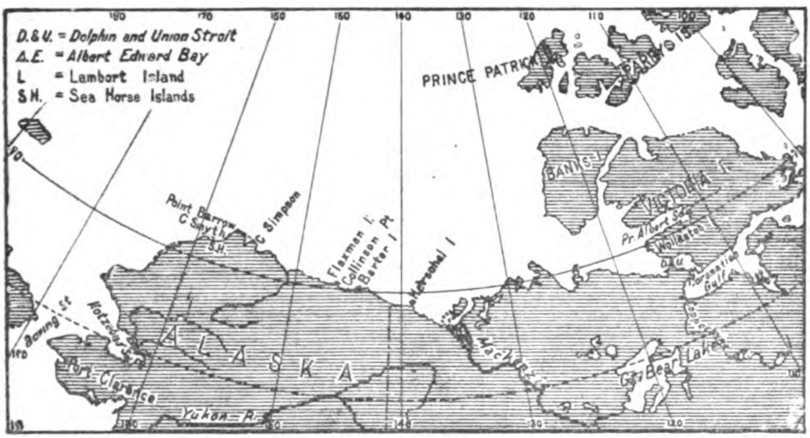
"We had three ships when we left Port Clarence, the *Karluk, Alaska* and *Mary Sachs*. I was in command of the *Karluk* with Captain B. A. Bartlett as sailing master. Dr. Anderson and Captain Otto W. Nahmens were in charge of the *Alaska*, and Kenneth C. Chipman and Captain Peter Beneard were in charge of the *Mary Sachs*. As the *Alaska* was detained at Port Clarence because repairs to her engines were needed, the *Karluk* and *Mary Sachs* left her behind, sailing on July 27. We do not know when the *Alaska* sailed. It was arranged that the three ships should meet at Herschel Island; but if the *Karluk* arrived there first she was to land certain stores she had on board for the other ships and then go north without awaiting their arrival.

"The *Karluk* party was to confine itself chiefly to exploring the sea west of the Parry Islands, and especially those unknown waters to the west and northwest of Prince Patrick Island. We hoped to take the *Karluk* north along the 141st meridian until we should discover land or she was stopped by ice. If we found land a base station was to be erected there; if we were stopped by ice our purpose was to try to follow its edge eastward and to make a base for our first year's work, preferably near the southwest

corner of Prince Patrick Island, charted as Lands End; or if this was not possible, on the west coast of Banks Island.

"The *Alaska,* after reaching Herschel Island, was to steam east and establish a winter camp on the south shore of Dolphin and Union Strait in the neighborhood of Lambert Island.

"The *Mary Sachs* was to steam east from Herschel Island to the head of Prince Albert Sound, the deep indentation on the west coast of Victoria Island, and land supplies for the geographical and geological exploration of Victoria Island in the spring of 1914; then she was to return to Beaufort Sea and give the rest of the season to oceanographical work south and west of Banks Island. Her work was to be almost wholly oceanographical during the



Map of the Arctic coast of Alaska and northwestern Canada showing Stefansson's field of work. Scale, 1:26,000,000.

three years of the expedition, with this proviso that she should be ready to assist in any way either the *Karluk* or the *Alaska.* She is schooner rigged, 33 tons, and has a net speed of about 6 knots an hour with the aid of her gasoline auxiliary engines. She has a captain and three men in the crew. Our oceanographer, Mr. James Murray, was to be the only member of the scientific staff aboard her. She was to carry some Eskimo helpers, and her winter quarters were to be at Herschel Island, or at any convenient point east of it.

"In equipment and number of crew the *Alaska* was to be the same as the *Mary Sachs.* The two vessels have about the same tonnage. The *Alaska* was to have, however, a large scientific staff

composed of Dr. R. M. Anderson, Commander, mammalogist and ornithologist; J. J. O'Neill, geologist; Kenneth G. Chipman, topographer, with J. R. Cox as assistant; Henry Beuchat and D. Jenness, anthropologists; Fritz Johansen, marine zoologist; William L. McKinlay, magnetician, and George H. Wilkins, photographer. Chipman, Cox, O'Neill, Beuchat and Jenness, all experienced men, were detailed by the Geological Survey of Canada. Wilkins is a competent cinematographer and it is expected that his pictures of the uncontaminated Eskimo of Victoria Island will be of great ethnological value; Dr. Anderson was with me for four years on our last expedition; McKinlay, a young graduate of Glasgow University, was thoroughly trained for his work, though without field experience.

"Mr. Chipman was placed in charge of the *Mary Sachs* at Port Clarence because the oceanographical equipment was on the *Karluk*, and Mr. Murray therefore had to go with the *Karluk* so as to be able, while sailing to Herschel Island, to divide this equipment suitably between himself and Dr. Mackay, who was to do the oceanographical work with the northern party. Mr. Murray, at Herschel Island, was to take charge of the *Mary Sachs* and Mr. Chipman was to be transferred to the *Alaska*.

"The southern party were to cover these departments of study: Mammalogy and Ornithology by Dr. Anderson; Marine Zoology, Botany and Oceanography by Johansen; Topography by Chipman and Cox; Geology by O'Neill; Magnetism by McKinlay; although McKinlay was placed in charge also of meteorology, the observations in this department were to be made by anyone at base camp when the others were engaged in field work. The location I selected for a winter base [Dolphin and Union Strait] was chosen because here driftwood from the Mackenzie River is likely to be in ample supply for firewood and house-building. There is much game also in this neighborhood, both caribou and seals. The country to the south as far as Great Bear Lake has never been crossed by white men. My observations on the edges of this section led me to believe that it is intersected by rivers running in deep gorges and largely covered by hills showing many precipices. In this case geological work can best be done here in winter, for the river cliffs, which cannot be reached on account of deep and rapid water in summer, may easily be approached on the winter ice. The topographers and geologists, it was therefore decided, should spend the winter of 1913-14 working up the region between the coast and Great Bear Lake. Then they were to cross Wollaston Peninsula late

in March to the head of Prince Albert Sound, and from the base which the *Mary Sachs* was to establish there, as mentioned above, they were to complete the mapping of the northeast coast of Victoria Island between the farthest points reached in their surveys by M'Clure and Amundsen (Hansen). They were also to explore the large river flowing into Prince Albert Sound from the east, and if possible the river which flows east from the center of the island into Albert Edward Bay.*

"The most favorable location in this district for anthropological work is on Dolphin and Union Strait. The Akuliakattagmiut tribe lives here and is the most westerly, and therefore the most isolated, of the copper Eskimos. Neither they nor their forefathers ever saw white men until the spring of 1910. It was among them and the Kanghirgyuargmiut tribe of Prince Albert Sound that European-like characteristics were found by us to be most pronounced. The latter tribe came in contact both with Collinson and M'Clure, but the evidence shows that this could have had practically no effect upon their manners and customs.

"It was left to Dr. Anderson to choose winter bases for the second and third winters, which would naturally depend upon the achievement of the first year.

"The scientific staff of the *Karluk* was to consist, besides myself, of George Malloch, geologist, detailed from the Canadian Geological Survey; B. M. McConnell, meteorologist and photographer; Dr. A. F. Mackay, surgeon and oceanographer; and Bjarne Mamen, assistant to the geologist and oceanographer.

"It was the purpose to have the *Karluk* give her summers as far as possible to the exploration of the unknown region; sledge journeys were to be made in winter over the sea ice in search for new land and to take soundings and carry out such other oceanographical work as was possible. In the summer season also the geology, zoology, botany and archaeology of any accessible land will be studied. Every effort was to be made at the end of the first year to transfer Mr. McKinlay to the northern party, so as to give more geographical scope to his magnetic work.

"These were our plans when we sailed. They may still be considered our plans, though mishaps have made it impossible at once to carry them out. It may be that the *Karluk* will not be able to continue her part of the work next summer. If this is so the *Mary Sachs* will take her place.

"The details I wrote of the summer happenings have probably

*** These two rivers were discovered by Stefansson on his last expedition.**

been printed in the newspapers. I shall not here repeat them. This was a bad ice year between Point Barrow and Herschel Island and the autumn frosts came much earlier than usual. The *Karluk* was solidly frozen in on August 17, and even on August 6 the young ice was strong enough to walk on near Point Barrow.

"There are ice ships no doubt which could have forced their way ahead in places where the *Karluk* was delayed. But, as she came up to her specifications and to our expectations of her, her failure to reach Herschel Island must be charged either to bad luck or bad judgment. In Port Clarence I took aboard the *Karluk* five members of the southern party: Murray because he had work to do on the *Karluk,* McKinlay because he was to establish a magnetic station at Herschel Island, Beuchat and Jenness because they wished to spend a few days with the Herschel Island Eskimos and Wilkins to take pictures. We expected to land these five men at Herschel Island, where they were to await the *Alaska,* excepting Murray, who was to transfer to the *Mary Sachs.* The latter vessel was to accompany the *Karluk* all the way to Herschel Island. The two vessels, however, were separated in a gale at Kotzebue Sound and I have not seen her since. I have only just learned at Point Barrow that both the *Alaska* and *Mary Sachs* are safe in winter quarters at Collinson Point. It is to be regretted that five men of the southern party are aboard the *Karluk,* for their work was to be with the other vessels which were carrying the provisions, equipment and clothing intended for them. We tried in August to land Beuchat and Jenness at Flaxman Island though eighteen miles of floating ice intervened, but it was impracticable to take them ashore with the six weeks' provisions they needed to equip them for a journey to Herschel Island should they find that the other vessels had passed to the eastward. If we had known, as we do now, that the schooners were at Collinson Point we might have landed the men without burdening them by heavy gear.

"If during the winter the *Karluk* should drift and come to rest within practicable distance from shore all the members of the southern party will be transferred to land to join the schooners.

"As for ourselves, situated as we are, we shall try to do such scientific work as there is opportunity to do. The two chief features of my winter plans are a sledge journey north from Barter Island and the exploration of the Mackenzie Delta. Both these projects may prove to be of considerable geographical interest.

"The ice journey over the sea north from Barter Island should be made in February and March. If we should attain a point

only 100 miles from shore we might determine the edge of the continental shelf at least; while if we should find ice conditions favorable, 300 miles does not seem too much to hope for. Our route would lie about 100 miles east of the place where Leffingwell and Mikkelsen made their sledge journey north on the sea ice. As far as I know no vessel has ever been over 50 miles from shore in the longitude of Barter Island. Barter Island hugs the coast in about 144° West Long.

"With regard to the exploration of the Mackenzie Delta I may say that the Mackenzie is the largest river in Canada, and is likely to attain some time a commercial importance second only to that of the St. Lawrence River. There is a serious hindrance to navigation in the series of rapids sixteen miles long between Smith Landing and Fort Smith, about midway between Athabaska and Great Slave Lakes. According to the Hudson Bay Company's figures this leaves about 1,500 miles of navigable water from the falls to the ocean, 1,300 miles of which have been repeatedly navigated by the screw propeller steamer *Wrigley,* drawing 6½ feet. The most northerly 200 miles have been navigated only by sail boat drawing less than five feet. This is the delta of the river. It is about 100 miles wide and there are numerous channels and islands.

"It seems likely that careful surveys of the more important of these channels will bring to light a route that will be safe for a steamer drawing the 6½ feet, which it could carry all the way (1,500 miles) south to the Smith Rapids. As the Mackenzie may spring into an importance comparable with that of the Yukon, it seems that the charting of its delta and the sounding of its channels is a work of great practical value. The main part of the survey work can most conveniently be done between March and July, inclusive. In March, April and the first half of May the work would be done by sledge and in June and July by boat, and the survey party would be at Herschel Island the last week in July ready to join the *Alaska* on her way eastward to Coronation Gulf to take up the regular programme of the expedition.

"We do not know, of course, what may happen to the *Karluk* this winter, but the experience of other vessels under similar circumstances may give us some light as to the probabilities.

"The bark *Young Phoenix* was abandoned in the ice off Point Barrow in August, 1888. Before the freeze-up that fall she was seen off Collinson Point, but no one boarded her. She was sighted the following spring in the ice off Sea Horse Islands. Eskimos

boarded her several times and she floated slowly up the coast about 7 miles from the shore. She was boarded by Mr. C. B. Brower and Mr. George B. Leavitt when she came opposite Cape Smythe and at that time she had incurred very little injury, though there was much water in her hold. She was not sighted later.

"The steam auxiliary bark *Navarch* in August, 1898, was abandoned twenty miles offshore from Point Barrow. She was one of the strongest vessels ever in the western Arctic. Late in September she was sighted again some 20 miles off Cape Simpson, when she was boarded by Mr. Thomas Gordon; and in October Mr. C. D. Brower went aboard with twenty-two dog sleds and took from her practically everything of value except her coal. In December she was sighted again, this time coming in from the west with the ice about twelve miles south of Cape Smythe. The ice brought her within two miles of the shore and then carried her parallel with the coast until she stopped three or four miles north of Cape Smythe. She was finally crushed by having her entire bottom forced off.

"In the autumn of 1909 the sailing schooner *Ivy* (140 tons) went aground three miles east of Point Barrow and the young ice formed around her. In December a strong southerly gale carried her off in the ice. In the following July she came into view again, drifting up from the southwest parallel to the coast, and passed Cape Smythe some twelve miles offshore. She was at first mistaken for one of the incoming ships and was not properly identified until it was too late. Other ships had been abandoned in the vicinity of Point Barrow and have never been sighted again. It is probable that many of them were crushed and sunk before winter set in.

"It seems likely, therefore, that the *Karluk* will be comparatively safe from the pressure while she remains a considerable distance offshore, and will be likely to be crushed if she comes in on the coast southwest of Point Barrow, for this stretch is exposed to strong gales from the open sea and consequent pressure. Ice pressure is also felt on the coast east of Point Barrow, but to a less degree.

"The men would be quite sure to get ashore safely if the vessel should be crushed in winter, but whether their equipment could be saved would depend upon her distance from land and the travel conditions over the ice. There would be more danger of loss of life should the *Karluk* be crushed next summer, although the chance of safety would be greatly increased by the fact that

the *Karluk* is equipped with three skin boats any one of which could carry the entire company (six scientists, fourteen crew and five Eskimos). These boats weigh each less than 500 pounds and are far stronger than a whaleboat or other wooden boat of similar size. It will be seen, therefore, that in the event of a retreat over the ice to the shore the party would not meet the terrible difficulties which the *Jeannette* expedition encountered because of the heavy weight and the fragile character of their boats.

"If the *Karluk* is seriously injured in the ice this winter or cannot get out of the ice next summer the *Mary Sachs* will have to take the *Karluk's* place in transporting the northern party to Prince Patrick Island. My present inclination is, if the *Mary Sachs* should reach Herschel Island while the coming of the *Karluk* is still problematical, to have her proceed to Prince Patrick Island, to be followed by the *Karluk,* if she is able to go on. It is possible that, under certain circumstances, I may decide to go by sled either to Banks Island or Prince Patrick Island this winter in advance of the ships. We should be able to complete the coast line survey and to carry out geological and archaeological work after the disappearance of snow in summer. We would not be likely to be in danger or great discomfort even should the vessels not be able to follow us next summer and we were thus compelled to spend the winter there."

SECULAR VARIATION OF PRECIPITATION IN THE UNITED STATES*

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The economic importance of accurate statistics of precipitation has never been so fully realized in the United States as at the present time, but unfortunately with this realization comes a demand, insistent at times, for the application of the available statistics to times and places beyond those which they truly represent. This is especially true of undeveloped regions in the boom stage. In some quarters there seems to be some reluctance to appreciate the basic proposition that measurements of precipitation for a single year at any given place represent simply the precipitation for that year and place.

It is well known that the horizontal distribution of precipitation for short periods of time varies enormously within comparatively small areas; thus, in 1901, the annual precipitation on the west coast of the Florida Peninsula, as at Tampa, was but 42 inches, while at Jupiter, on the east coast, it was 76 inches, a difference of 34 inches in about 160 miles. Similar illustrations may be drawn from any other part of the country.

We distinguish two classes of variation in the horizontal distribution of precipitation, first, those of a local and temporary character which so far as can be discovered are purely accidental and, second, those which persist for a series of years and do not appear to be accidental. The first class is probably compensatory in character, and, from an economic viewpoint, is of little importance. The second class, on the other hand, may be of tremendous importance, as when the precipitation is so heavy as to lead to disastrous floods over large areas, or so light as to cause failure of crops.

At the present point in the discussion we will consider merely the effect of these two classes of variation in constructing a system of normal charts. The first class, being compensatory, has no effect on the normals provided the observations are continued over a long series of years, but the use of a short period of observations, say 5 or 10 years, is fraught with danger. Variations of the second class

* Read before the Association of American Geographers at New Haven, Dec. 27, 1912.

when they persist through a term of years naturally produce a material change in normal charts. The most notable example which has come to the writer's attention is the marked diminution in precipitation which has evidently taken place in the West Gulf states and lower Mississippi Valley within the period of measurements made by the United States Weather Bureau, which now extend over a period of 40 years.

The small table below shows the extent of the variation by ten year periods at four representative stations, as follows: Galveston, Tex., Shreveport, La., Vicksburg, Miss., and New Orleans, La.

STATIONS	GALVESTON	SHREVEPORT	VICKSBURG	NEW ORLEANS
1st ten years............	51.8	52.9	59.3	65.6
2d ten years.............	50.1	48.7	55.3	57.6
3d ten years.............	40.6	38.1	49.2	50.3
4th ten years............	43.2	41.3	49.1	50.1
1st period minus last.....	8.6	11.6	10.2	15.5

Further comment on the above will be made later in this paper.

We will now attempt to examine the precipitation statistics for the country as a whole. The United States Weather Bureau publishes each month in the *Monthly Weather Review* the anomalies of precipitation, temperature, humidity and cloudiness for each of the nineteen climatic districts into which the country has been divided. The number of stations in each district from which the district departure is obtained varies from 4 in the case of the smaller districts to 15 in the case of larger and more thickly populated districts. Naturally the eastern two-thirds of the country has a larger representation than the western third. While it is possible to sum the anomalies for the whole of the United States and thus obtain a single unit which shall represent the anomaly for a month or a year, it is difficult to assign a proper value to the result which we would thus obtain. The different districts are unequal in area, therefore any value we might assign to the numerical departures for each district would be more or less in the nature of an arbitrary assumption, and consequently objectionable. Unless the district departures for any year are of considerable magnitude, either positive or negative, a numerical value for the whole country is apt to represent merely the small balance between positive departures in one part of the country and negative departures in other parts. If instead of attempting to compute

the numerical departure for the whole country we count for each year simply the number of districts with positive or negative departures respectively, having regard for the magnitude of the departures, the result will afford us, it is believed, a rough measure of the distribution of precipitation generally over the country as a whole.

The writer has summarized the annual precipitation departures for the whole country for 25 years, 1887 to 1911, in this way. He has considered only those regional departures which amounted to 2 inches or more, on the average, for the whole district and has counted simply the number of departures of that magnitude which have occurred in all of the districts for each year. Twenty-five years have been considered, and since there are 19 districts, we have 25 times 19, or 475, as the total number of annual departures used in the summary. Dividing these according to their magnitude we find that but 276 of them were greater than two inches. One hundred and ninety-nine (199), or 42 per cent., therefore have not entered into our computation, except as hereinafter stated. The departures greater than two inches are divided into 79 positive and 197 negative, or very nearly in the ratio of one to three. The preponderance of negative departures, by which is understood, of course, a diminished precipitation, is the most prominent feature of the summary. This statement, however, has a better aspect when we consider that the 199 districts having a plus or minus departure of less than two inches were actually years of very nearly normal precipitation; adding to these the 79 years of greater than normal rainfall, we have 278 districts out of 475, or 58 per cent., closely approximating the normal. On the other hand, the precipitation of 42 per cent. of districts was deficient by average amounts greater than two inches. The years in which a majority of districts showed precipitation in excess of the normal, eliminating annual departures of less than two inches, as above, were 1888, 1890, 1891, 1906, and in 1909 as many districts had precipitation above normal as below it. The dry years were 1887, 1894, 1895, 1899, 1900 and 1910—six in all, or nearly double the number of wet years. Unfortunately for our purpose reliable district departures for the known rainy years in the early eighties and the late seventies are not available.

An examination of the district departures for the United States as a whole lends no color to the theory of a cycle in precipitation, as advocated in some quarters in Europe. To this statement objection will be made on the ground that the period of observations

here considered is too short. We would reply that in several portions of the United States comparable precipitation measurements have been carried on over half a century; these do not afford any indications of a long period cycle or progressive change from wet to dry, and *vice versa,* but in practically every case confirm the conclusion that the occurrence of wet and dry years seems to be wholly fortuitous so far as the United States are concerned. In this vast area the causes that operate to produce years of light or heavy precipitation are subject to the same variations as the seasons themselves, and the likelihood that all of these various and complex forces should conspire to produce light precipitation or heavy precipitation all over the country is remote. In the history of this country the Mississippi River has never been in flood due to high water in *all* of its tributaries at the same time. The probability that all of its tributaries will be in flood at the same time is also remote, and on the same grounds the probability that heavy rains will occur in all parts of the country in one and the same year is so small that we ought not to be surprised at the relatively few positive departures disclosed in the summary above mentioned. On the other hand, diminished precipitation over great areas seems to occur with much greater frequency than increased precipitation. The tendency in nature, as shown by the summary of the last quarter of a century, seems to be toward years of lean rainfall, while years of fat rainfall seem to be due to an extraordinary deflection or disturbance in one or more of the dominant members of the atmospheric circulation; thus, when a majority of storms of any one year move from the North Pacific coast southeastward to Texas, thence northeastward to New England, there will be abundant precipitation in that year over the West Gulf states, the lower Mississippi and Ohio valleys, and the Middle Atlantic and New England states, whereas a dearth of storms moving in that direction is generally coincident with years of small precipitation in the same districts. In none of the 25 years here considered, 1887-1911, was precipitation in excess of the normal in all districts of the United States, and in but one year, 1910, was there a deficiency *in all districts from the Atlantic to the Pacific.* In that year the weather was abnormal in other respects than in precipitation. Beginning with an abnormally warm and dry spell which was general over the country the weather turned cool and relatively wet, and this latter was in turn followed by dry, hot weather which began in some districts in June and continued through the summer months. The peculiar-

ity of the precipitation of 1910 lies in two facts: first, a part of the deficiency in the total rainfall came at a time when precipitation was not essential to crop and vegetable growth; and second, in almost all sections there was considerable moisture in the ground at the beginning of the drouth.

From what has already been said it will be clearly understood that the precipitation varies not only from year to year but also as between the different parts of the country. During the historic drouth of 1894, in the interior valleys and the Atlantic seaboard, precipitation was unusually heavy on the North Pacific Coast states and the Northern Plateau, and it was normal in California. In the last 25 years the three Pacific Coast states, also the western Rocky Mountain Slope region, embracing parts of Montana, Wyoming, Colorado, western Nebraska and Kansas, Oklahoma, the Texas Panhandle, New Mexico and Arizona, have had a greater number of years of precipitation above the average than other portions of the country. The districts poorest in rain were the South Atlantic and Gulf states. The Lake Region, Ohio Valley and Tennessee, New England, and the Middle Atlantic states, were also deficient but not to so great a degree; practically the whole country east of the Mississippi has been passing through a rather prolonged period of deficient precipitation in which, however, there have been interspersed a few years of abundant precipitation. Inasmuch as the amount of the annual precipitation differs both in time and space the question of chronological variation can best be examined by considering relatively small regions where comparable measurements are available for a long period of years. The writer has examined the yearly fall of rain and snow for a 40-year period, 1872-1911, in four separate localities, and presents the results in diagrammatic form in this paper. The regions selected are, the West Gulf states and lower Mississippi Valley, represented by the four stations Galveston, Shreveport, Vicksburg and New Orleans, two coast and two interior stations; the state of North Carolina, represented by stations at Hatteras and Wilmington on the eastern coast, and Lenoir, in Caldwell County. The first named stations are practically at sea level, the last named is at an altitude of 1,186 feet, and distant about 30 miles to the eastward of the mountain systems which extend northeast and southwest, parallel with the western boundary of the state. The third region is New England, represented by eleven stations, viz., Eastport and Portland, Me., Concord, N. H., Burlington, Vt., Boston, New Bedford, Springfield and Taunton, Mass., Providence, R. I., and Hartford and New

Haven, Conn. The fourth district was selected to represent the interior of the country. Fortunately the geographical center of the United States is also a region near which precipitation measurements extending over half a century are available. This region is represented by five stations, two of which have measurements of precipitation extending over 61 years or from 1850 to 1910, the third station began its record in 1856, the fourth in 1858, and the fifth and last in 1868. The names of the stations are Fort Leavenworth, Kan., and Miami, Mo., 1850-1911; Oregon, Mo., 1856-1911;

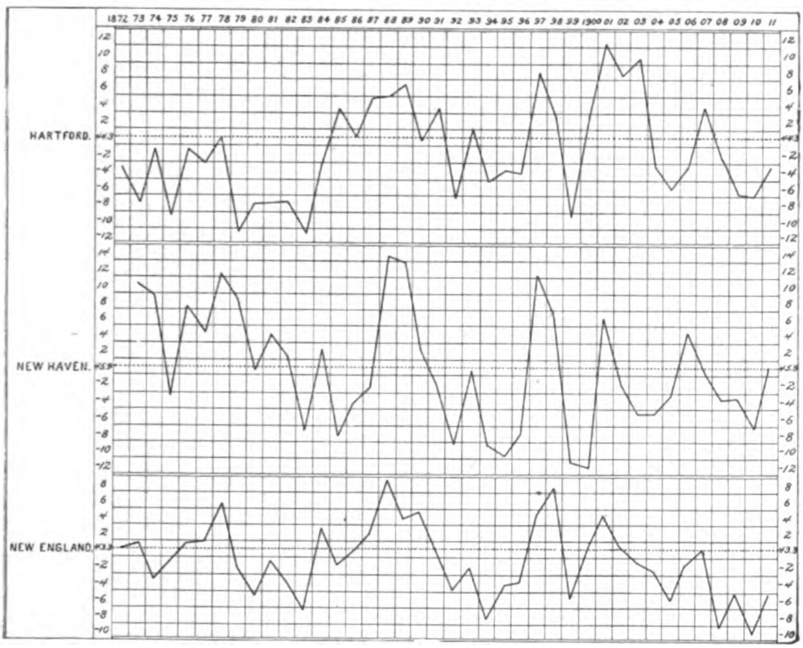

Fig. 1—Chronological Variation of Precipitation in New England, 1872-1911.

Manhattan, Kan., 1858-1911; and finally Lawrence, Kan., 1868-1911. These five stations are so situated that if a circle of 86 miles radius be drawn from Fort Leavenworth, Kan., as a center, all of them would fall within the circumference of that circle.

Diagrams have been prepared (Figs. 1, 2 and 3) to show graphically the chronological variation in the above-named four districts. The purpose of the first figure of the series is to show the variations in horizontal distribution not only from the district mean but also as between nearby stations, such as Hartford and New Haven, Conn. The curves for this pair of stations show important dif-

ferences from each other and also from the general mean of the district.

It is apparent on inspection that the annual precipitation progresses from year to year in an exceedingly irregular manner and without, so far as is discoverable, any approach to uniformity of distribution in time or space. One year of heavy rain may be succeeded by a second, third or even a fourth year of abundant precipitation, and again a single year of heavy rain may be followed

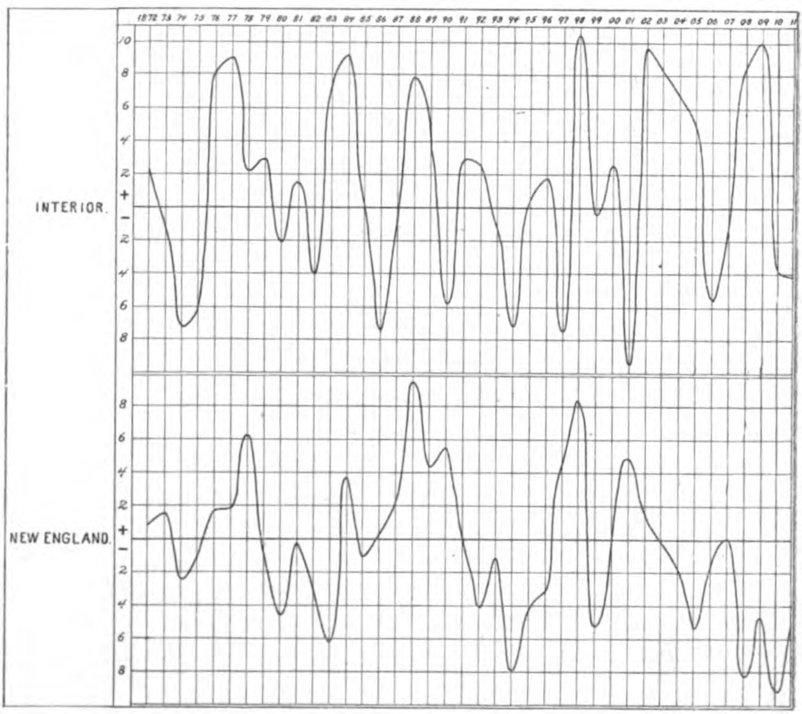

Fig. 2—Chronological Variation of Precipitation in the Interior and New England, 1872-1911.

immediately by a year of light rain. The numerical values on which the Missouri Valley curve ("Interior" on Fig. 2) was constructed show that the greatest number of consecutive years with positive departures was 4, viz., from 1876 to 1879, both inclusive. A second period of four consecutive years with abundant rains occurred in the early years of the twentieth century, viz., from 1902 to 1905, both inclusive. The interval between these two periods is 27 years. From 1850 to 1872 in the Missouri Valley there was no period of abundant precipitation equaling the above,

although the precipitation of 1851 and 1852, also 1858 and 1859, was abundant. Between 1850 and 1911 there were 18 periods varying in length from a single year to three consecutive years with light precipitation. There was a greater number of dry periods from 1850 to 1875 than in the subesquent portion of the record, viz., 17 in 26 years as against but 13 in 36 years. In the period common to all districts, 1872-1911, the Missouri Valley was dry in 1873, 1874 and 1875, also in 1885, 1886, and 1887, again in two two-year periods, 1893 and 1894, and 1906 and 1907. Considering the total period of 62 years, 29 were wet and 32 dry. In the same way we may analyze the New England record for the 40 years, 1872-1911 (Fig. 2). Nineteen of these were wet years and 21 dry. The West Gulf states curve for the same period gives 18 wet years and 22 dry years, North Carolina, 20 wet and 20 dry (Fig. 3).

The curves showing the annual variation for the West Gulf states and North Carolina are essentially different from those first considered. Instead of years of heavy and light precipitation following each other at comparatively short intervals, the years of heavy precipitation in both southern districts are massed in the early part of the record, and the years of deficient precipitation in the last half. The run of years with deficient precipitation in these two districts is unprecedented in the United States and the phenomenon might be viewed with serious alarm were it considered by itself alone. I wish to direct attention to the fact that in the midst of the long run of years of deficient precipitation suddenly there appears one or more years of heavy rains, as in the West Gulf in 1888, 1900, 1901, and 1905, in North Carolina in 1901 and 1908. The year 1888 was one of abundant rains in other parts of the United States, and so were the other years, though in a less degree. This suggests at once that the control of precipitation, whatever it may be, is general in its operation rather than local. The precipitation of the year 1905 was peculiar in that the regions of abundant rains were all west of the Mississippi. The East Gulf states were in the region of negative departures, while the West Gulf states had well-marked positive departures. Since it seemed that here the differences might be due to local influences the record of weather conditions pertaining to the Gulf states for the entire year were closely examined, with the following result. The character of the rain year was determined by the amount of rain which fell over the West Gulf states in April and June. In April four well-marked rain periods occurred in connection with that number of

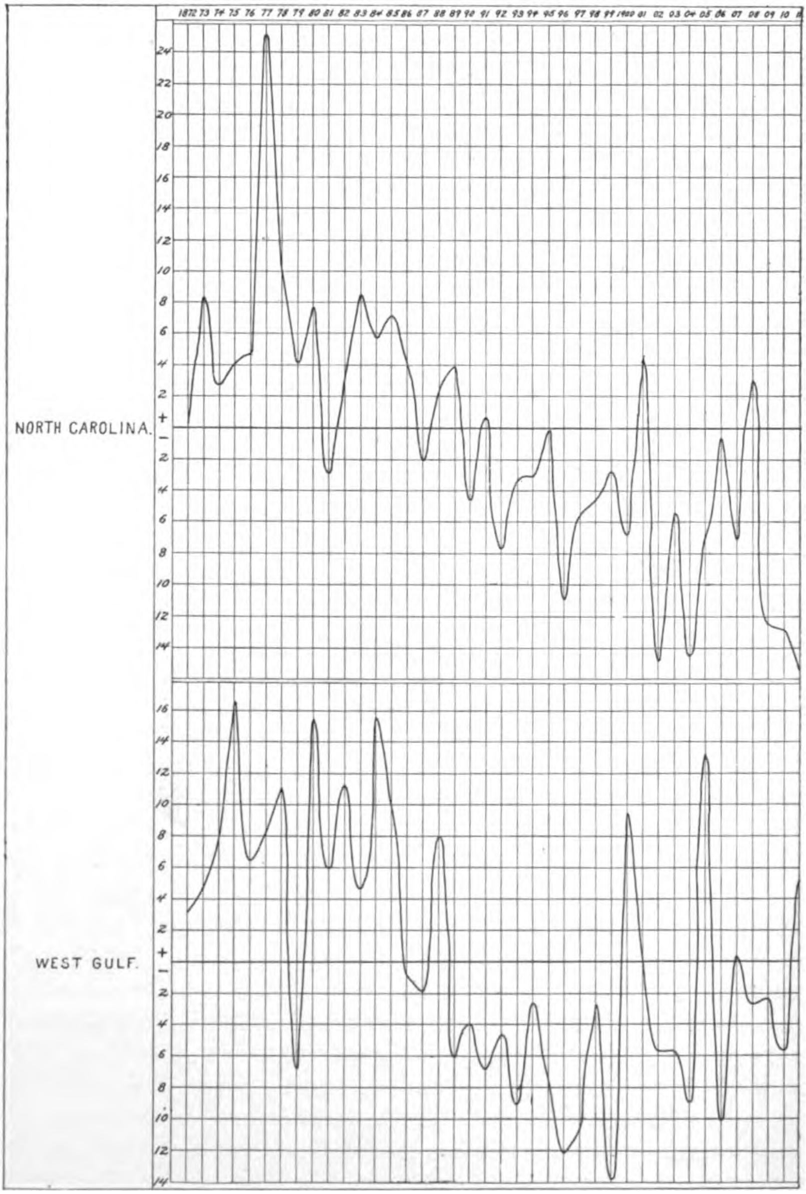

Fig. 3—Chronological Variation of Precipitation in the West Gulf States and North Carolina, 1872-1911.

cyclonic disturbances, three of which moved southeastward from the North Pacific coast and curved to the northeast over the West Gulf states; the fourth developed as a secondary disturbance over Texas and followed the path of the others. All of these disturbances were accompanied by heavy precipitation over the West Gulf but not the East Gulf states. The heavy rainfall of June was due to a shallow barometric depression which overspread the West Gulf states and the Mississippi Valley from about the 18th to the 26th and gave heavy and continuous rains for about 10 consecutive days. This depression was not even charted among the storms of the month, so indefinite were its boundaries and so devoid of movement was it, yet the conditions it embodied were ideal for producing heavy and continuous rains. Such barometric conditions develop only at long intervals, and thus again the same idea that has been suggested elsewhere in this paper presents itself, viz., that it is the exception rather than the rule that atmospheric conditions are favorable to heavy rains over widely extended districts, and that the probability of such rains becomes less the greater the area involved. The probability that the rainfall will be normal is also very small; for the 25 years elsewhere considered it might have been represented by the fraction 2/475. The distribution mostly to be expected is that which approaches closely to or falls slightly below the normal.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Additions to the Map Collection. The following are some of the more important maps recently received by the Society: The new 9-sheet map of the United States, by the U. S. Geological Survey (1:2,500,000); Part I (Pines) of the Forest Atlas of the United States, issued by the same bureau; the set of the published sheets of the half-inch-to-mile topographic map of Canada, published by the Department of Militia and Defence; the 1:2,000,000 general map of Mexico, published by the Department of Public Works; Paulsen's large-scale map of the oilfields of Mexico*; the railroad map of Brazil, published by the Ministerio de Viação e Obras Publicas (1:2,000,000); Dr. Jannasch's Map of Central Argentine and Chile and his special map of Santa Catharina, Rio Grande do Sul and Uruguay (both 1:1,000,000); the "Karte des Sperrgebietes in Deutsch-Südwestafrika," published by Reimer (1:100,000); the set of 31 maps (1:200,000) accompanying the account of Dr. Albert Tafel's explorations in China and Tibet*; the set of itinerary maps to illustrate Count Charles de Polignac's travels in China; the sheets of the 40-verst map of Asiatic Russia and adjoining countries; revised sheets of the bathymetric map published by the "Cabinet Scientifique du Prince de Monaco," Paris*; 560 sheets of the 1:100,000 map of France published under the auspices of the Ministère de l'Intérieur.

Professor Bowman's Lecture on the Central Andes. At the special inter-monthly meeting on February 3, Professor Bowman lectured before the Society on the Central Andes. His remarks were based on his three expeditions to this region, the last carried out during the past summer under the auspices of the American Geographical Society, the results of which are published at the beginning of this number. Professor Bowman's remarks, supplemented by lantern slide views, dealt with a cross-section from west to east through the Central Andes, which he defined as that portion of the Andean highland which is characterized by interior drainage. Paralleling the coast first come the relatively low coast ranges, to the east of which lies a desert strip characterized by the *salars* which contain the nitrate deposits that are of such economic importance to Chile. On the east this desert strip is bordered by the Western Andes, or Maritime Cordillera, which together with the Eastern Andes, or Cordillera Oriental, on the eastern margin of the Andean highland, enclose the great central basin, or *altiplano*. The general conception of the Maritime Andes as a majestic range of lofty mountains rising abruptly from the sea is incorrect; they are rather a broad plateau, a peneplain uplifted to an elevation of 14,000 ft. This was well brought out by Professor Bowman's lantern slides, which showed broad slopes characterized by relatively little relief. It was only when a picture of the Cordillera Oriental was thrown on the screen that rugged alpine forms with snow-capped peaks appeared. In great contrast to these and to the general aridity of the Andean highland, which they join on the east, are the Amazon lowlands with their high precipitation and tropical forests. The degree of this contrast was well illustrated by the last slide, which represented a huge epiphyte, which, by the very attitude of its branches, seemed to be devouring the host upon which it grew—a picture of the luxuriance of life in the lowlands compared with the barrenness and aridity of the highland. Professor Bowman also referred in detail to the human inhabitants of the region and their activities, particularly to the trade in cattle carried on between Salta and Jujuy in northern Argentina and the nitrate camps in the desert near the Pacific coast which involves driving the animals, summer and winter, over passes more than 15,000 feet high, and forcing them over waterless districts where they sometimes have to go without food for as long as three days.

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* Reviewed in the *Bulletin* as follows: Mexico, Vol. 46, 1914, p. 156; China, Vol. 45, 1913, pp. 877–879; bathymetric map of the oceans, Vol. 46, 1914, pp. 158–159.

NORTH AMERICA

Oceanographical Investigations by the Department of Commerce. On Sunday, January 25, the Coast Survey Steamer *Bache* sailed from Hampton Roads on an oceanographical cruise which will embrace the physical, zoological and botanical inquiries that are now recognized as of importance to navigation, the fisheries and meteorology. The cruise will be from Cape Henry to Bermuda, and thence to the coast of Florida. In addition, lines will be run across the narrowest part of the Gulf Stream between Florida and the Bahamas and from Key West to Havana. Soundings, the deepest of which will be in water over three miles deep, will be made at intervals of from ten to seventy-five miles. The temperature of the water will be taken at various depths between the surface and the bottom. Specimens of water will be secured from different submarine levels. The direction and velocity of water currents will be ascertained in investigating the tides and currents at a distance from shore, and possibly in the deep sea.

Plants and animals will be collected not only at the surface and the bottom, but at intermediate depths. Microscopic organisms which serve as the food of larger animals, and on which the distribution and even the existence of fishes is ultimately dependent, will also be collected. Particular attention will be paid to the collection of young fishes, through the study of which it is hoped light may be thrown on the spawning places and migrations of species valuable to man, but the whereabouts of which during a considerable part of their lives is now unknown. Studies of this kind have recently shown that the eels inhabitating the rivers and coastal waters of Europe and America are spawned somewhere near the Sargasso Sea in the middle of the North Atlantic, whence they are distributed, as flat, more or less ribbon-like, transparent young, through the medium of the Gulf Stream and other oceanic currents.

The investigations are being conducted by the Department of Commerce, through the Coast and Geodetic Survey and the Bureau of Fisheries. Captain Charles C. Yates, of the former bureau, will be in command of the vessel, and the Bureau of Fisheries will be represented by Messrs. W. W. Welsh and John V. Greene. The entire cruise will probably occupy a little less than two months.

The Future of the Maryland Oyster Industry. The U. S. Coast and Geodetic Survey, which has participated in the work of the Maryland Oyster Survey, has just issued a "Summary of Survey of Oyster Bars of Maryland, 1906-1912," by C. C. Yates, giving concisely the history of the oyster industry of Maryland, a statement of its prospects, with charts, a diagram, index to natural oyster bars, index to triangulation stations, etc. With regard to the future of the industry the report says:

"It now seems not only reasonable, but probable, that within the next generation the citizens of Maryland will be leasing and cultivating a probable 100,000 and a possible 300,000 acres of so-called 'barren bottoms' where oysters do not now grow in commercial quantities; that tne more than 200,000 acres of natural oyster bars now reserved for the use of the oystermen as a result of the Maryland Oyster Survey will be so conserved and developed that they will produce, as they have done before, twice the amount they now yield; that the oyster industry of Maryland will then be based on an annual production of 20,000,000 bushels of oysters where now it is barely 5,000,000; and that the physical valuation of the state-owned oyster lands will then be $100,000,000, where now it is not more than $20,000,000."

Publication of the 1:500,000 State Maps. Sixteen sheets have been published to date by the U. S. Geological Survey, namely: Alabama, Arkansas, Delaware, Georgia, Illinois, Indiana, Iowa, Michigan, Minnesota, Mississippi, Pennsylvania, New Jersey, Ohio, South Carolina, Tennessee and Vermont. These maps are published in black and white and are intended to serve as bases for geological, forestry, agricultural or other detail. They were described in the *Bull.*, Vol. 44, 1912, p. 841.

Archdeacon Stuck's Ascent of Mt. McKinley. *Scribner's Magazine* for November, 1913, contained Archdeacon Stuck's account of his ascent of Mt. McKinley. He had the cooperation of Mr. H. P. Karstens, without whose help, the Archdeacon frankly says, he would not have undertaken the enterprise. Their success in making the complete ascent (Professor Parker and Mr. Belmore Browne had earlier attained within about 100 feet of the top) appears largely to have been due to their forwarding the outfit by river in the previous autumn, so that their supplies were only fifty miles from the base of the mountain when they began their work in March, last year. Establishing at a base camp at 4,000 feet a cache of fresh pemmican, they found later that the suitability of this food could not be surpassed. They followed the route that the miners McGonogall and Anderson opened in 1910. This route was also adopted by Professor Parker. Archdeacon Stuck was able to substantiate the claim of the miners that they had ascended the mountain, though the summit reached by them was not the highest peak, but the secondary summit to the north. Stuck's party saw, through their glasses, the flagstaff which the miners had erected.

When the climbers reached the head of the Muldrow Glacier (11,500 feet), which drains the whole northern face of the mountain, they found that the north-eastern ridge separating the two branches of the glacier and offering the only means of ascent to the snow basin above had completely changed in appearance since Professor Parker was there. He described it as ''a steep but practicable snow ridge.'' It was now, however, a jagged mass of rocks and ice, the transformation having been wrought evidently by the severe earthquake noted by the Parker party on their descent of the mountain.

This added greatly to the difficulty of the ascent. Each individual block had to be climbed over or circumvented. No space was found large enough to pitch a tent and it was necessary, therefore, to return each night to the glacier camp. Bad weather also caused delay; but when the ridge was at last surmounted bright sunshine favored the final climb, though the party was suffering from cold and the difficulty of breathing in the rarefied air. A mercurial barometer carried to the top gave a reading of 13.6 inches. Many of Archdeacon Stuck's descriptions are very realistic, especially that of the stupendous ice fall of 4,000 feet from the upper basin to the glacier below.

Archbishop Stuck pleads for the retention of the native name Denali for the great mountain. Why Denali rather than Bolshaya or Traleyka, as it was also called? The mountain was first reported in recent time by Mr. Dickey, who estimated its height at 20,000 feet, within about 300 feet of its real elevation, and he expressed his opinion that it was the highest mountain in North America, as it is, according to our present knowledge. Bearing the name of our martyred President, which was given to it by the rediscoverer of the mountain, there is very little probability that it will cease to be known by the name it now bears on maps and in all reference books.

The Grand Trunk Pacific R.R. Nearly Completed. Regular passenger train service has begun on the Grand Trunk Pacific to Prince George, 1,279 miles west of Winnipeg. There now remains only a gap of 116 miles west of Prince George, and upon the completion of this stretch the whole system will be in operation from coast to coast.

SOUTH AMERICA

Population of Colombia. According to the census of Colombia taken on March 5, 1912, the population of the republic is 5,072,613, distributed among the departments as follows: Antioquia, 740,937; Atlántico, 114,887; Bolívar, 420,730; Boyacá, 586,499; Caldas, 341,198; Cauca, 211,756; Cundinamarca, 713,968; Huila, 158,191; Magdalena, 149,547; Nariño, 292,535; North Santander, 204,381; South Santander, 400,084; Tolima, 282,426; Valle, 217,159. About 300,000 persons living in the intendencias, comisarias and the government hospitals make up the remainder of the population.

AFRICA

New Port and Railroad for Nigeria. The *Geographical Journal* (Vol. 42, 1913, p. 398) says that a new trunk line is to be built from the Niger Delta to the Udi coal fields, east of the lower Niger in the latitude of Onitsha, a town on the river, thence to the Benue River, which will be crossed by a large bridge, and on along the border of the Bauchi Highlands to the Kaduna R., where it will be linked with the existing railroad to Kano. It will pass near the Bauchi tin fields, to which a branch line may be built. A particularly favorable site for the seaward terminus has been secured, it is said, through the recent discovery of a creek, apparently a branch of the Bonny R., with fifty feet depth of water at the shore edge. It will be possible here to build a town with wharves and railroad shops, and it is thought the port will become the coal distributing center for the whole of West Africa. The railroad will be 550 miles long and it will be four or five years in building.

The Harmattan of the Coast of Guinea. A paper on "The Harmattan Wind of the Guinea Coast," by H. W. Braby of the London Meteorological Office (*Quart. Journ. Roy. Met. Soc.*, Vol. 39, 1913), brings together the results of observations made at Zungeru, Northern Nigeria. It is significant that during the winter the notes in the "Remarks" column of the meteorological record at this station relate almost entirely to the harmattan. The importance of this wind is thus easily recognized. The harmattan blows intermittently during the winter (Nov.-March) along the coast of Upper Guinea, from French Guinea to the Cameroons. The wind is very dry, and carries a fine sand which comes through the crevices of doors and windows and covers everything with dust. While generally regarded as health-giving, its extreme dryness is trying to newcomers. Locally, the harmattan is known as "the doctor." The direction of the wind is northeast, which explains the presence of the Saharan dust, and it partakes somewhat of the nature of the föhn blowing from more elevated to lower districts. The stronger the wind the lower the relative humidity. R. DEC. WARD.

The Egyptian Survey Department. A report of the Egyptian Survey Department published in 1913 records the work done during 1911. The third order triangulation for the cultivated area of Egypt was completed in 1911. Publication of the 1:50,000 sheets of the atlas of the cultivated area is advancing. A new 1:100,000 topographic series of cultivated areas with the adjoining desert to include the Nile escarpments was begun. This map is compiled for the Irrigation Service. The year was marked by special activity in the work undertaken by the Department to insure the steady development of Egyptian mineral resources. Meteorological and seismological observations as well as cadastral and town surveys were a part of the ordinary routine.

ASIA

The Identity of the Sangpo and the Brahmaputra Proven. A telegram from Calcutta on November 18 announced that Captain F. F. M. Bailey of the Political Department and Captain Morshead of the Survey of India had returned to India after successfully exploring the Sangpo. Their journey was an arduous one, but they conclusively proved that the Sangpo and Brahmaputra are one and the same river. This has for years been regarded as a certainty, but the fact had not actually been proven. The total distance traversed by the explorers is said to have been 1,700 miles, the travelers finally emerging at Dewangiri in Assam, after a journey of thirteen months from the first stop in the Mishmi country.

AUSTRALASIA AND OCEANIA

Professor Davis's Visit to Australia and Oceania. Professor W. M. Davis has received a grant from the Shaler Memorial Fund of Harvard

University for a journey across the Pacific, to examine the coral reefs of several groups of islands. He sailed from San Francisco on Feb. 11 for Honolulu, and goes thence to the Fiji Islands, where he will spend a month, then probably by Samoa and Tonga to New Zealand, where he will remain a month. In June he hopes to reach New Caledonia. August will be given to Australia, where he will be a guest of the British Association in Melbourne, Sydney and Brisbane. In early September he will take part in a supplementary meeting arranged by the Government of New Zealand. A stop will be made in the Society Islands during the return voyage, and San Francisco will be reached in November. His address is, care of Raymond-Whitcomb Co., San Francisco, Cal. (five cent postage).

The Crozet Islands Annexed by France. The French Government announces that it has formally annexed to the republic the Crozet Islands in the South Indian Ocean. This island group (46° - 47° S. and 51° E.) was discovered by the French sailor Marion-Dufresne in 1772, who landed on the largest island of the group and took possession of it in the name of the King of France. The island upon which he landed is still known as Possession Island. Until now, the French Government has never asserted its authority over the islands. The group, of volcanic origin, includes three large and several small islands, of which the largest is about fifteen miles long and seven miles wide. It is a great resort of the albatross; and the hogs left there by seamen have largely multiplied. The most complete description of the islands was supplied in 1901 by the German South Polar Expedition under Drygalski. The islands are near the ocean route between Cape Town and Melbourne, a fact that has given them some importance. The best anchorage is in Ship's Bay, on the east side of Possession Island.

EUROPE

Dr. Keltie's Work for Geographical Education. The *Geographical Teacher*, Vol. 7, 1913, Part 3, p. 141, says that the Council of the Geographical Association has asked Dr. J. Scott Keltie, Secretary of the Royal Geographical Society, to be President of the Association for 1914. He has consented to take the office. The *Geographical Teacher* adds: "It is appropriate that he should be President next year, for it was in 1884—thirty years ago—that he was commissioned by the Council of the Royal Geographical Society to visit schools, training colleges and universities, both at home and abroad, and to report on the provision made for teaching geography in them. The publication of this report led to a revival of the teaching of geography in this country, and all who have attempted to improve this teaching are indebted to him not merely for this initial stimulus, but for constant advice and encouragement. The Council of the Association has asked him to review the progress made in the teaching of geography in this country since 1884, and we all look forward to an interesting and valuable address."

The Museum for Meereskunde in Berlin. This museum is planned to give an understanding of the sea and its phenomena, to exhibit the means of investigation and the abundance of marine life, and to set forth the economic and national significance of navigation, marine commerce and sea power. Its scope embraces the chemical and physical conditions and the movements of ocean waters. In a very elaborate fisheries collection, including many models of ships and apparatus, the methods of winning the treasures of the sea are placed before the eye, and sea products in striking variety are displayed. An historico-economic collection is devoted to shipbuilding, navigation and sea commerce, to harbors and rescue appliances. Another department illustrates the history and development of the German navy.

The museum was founded by Professor von Richthofen, but in recent years has been greatly expanded under the administration of the present Director, Professor Albrecht Penck. It is situated quite near the Royal Library and the central building of the University. Under the same roof, and also under the direction of Professor Penck, is the Geographic Institute of the University.

A formal opening of the enlarged and reorganized museum was held on Saturday, December 6. Many geographers, naval officers and members of the imperial government were present. The principal address, by the Director, was followed by a short response by Kultusminister v. Trott zu Solz, who spoke appreciatively of the development and public value of the museum. The collections are rich in variety and interest and will do good service both in popular education and as an adjunct in special geographical training.

A. P. Brigham.

Lightning Conductors on St. Paul's Cathedral, London. During the recent installation of new lightning conductors on St. Paul's Cathedral, London, there was discovered part of one of the original bar conductors erected about 140 years ago under the supervision of Benjamin Franklin. This bar was inside one of the towers, and was thus not exposed to the weather. The London *Times*, commenting on the discovery of this old lightning rod, said: "The fixing of the 'Franklin rods,' as they were called, led to a heated controversy as to whether lightning conductors should have points or balls as terminals. The President of the Royal Society, who advocated points, had to resign. King George III was a strong adherent of ball terminals, but time confirmed Franklin's view."

R. DeC. Ward.

Congrès International d'Ethnologie et d'Ethnographie This congress will meet at Neuchâtel, Switzerland, on June 1-5, 1914, under the active presidency of Professor Gustave Jéquier, Professor of Egyptology in the University of Neuchâtel. The official languages of the congress will be French, German, English and Italian. The length of papers is limited to twenty minutes, and the price of membership in the congress has been fixed at ten francs.

OCEANOGRAPHICAL

Ocean Fleets of the Nations. B. Huldermann's "Geschäftslage und Entwickelung der Seeschiffährt," (Mittler & Sohn, Berlin, 1913) contains the following table giving a comparative view of the tonnage of ocean-going vessels as distributed among the leading sea powers and over a series of years:

IN 1000 GROSS REGISTERED TONS

	1890	*1900*	*1905*	*1910*	*1911*	*1912*
World fleet	22,152	29,044	36,001	41,915	43,147	44,601
Belonging to:						
Great Britain with Colonies	11,597	14,261	17,010	19,012	19,419	19,674
United States	......	2,053	2,649	2,762	2,809	2,849
Austria-Hungary	270	416	618	779	846	903
Denmark	280	519	628	737	753	753
The Netherlands	379	530	702	1,015	1,058	1,130
France	1,045	1,351	1,728	1,882	1,977	2,053
Germany	1,569	2,650	3,565	4,333	4,467	4,629
Italy	817	984	1,189	1,321	1,341	1,399
Japan	172	575	874	1,149	1,203	1,345
Norway	1,584	1,641	1,776	2,015	2,154	2,203
Russia	427	721	863	885	895	937
Spain	535	695	723	767	776	772
Sweden	476	637	864	917	931	970

The Work of the Oceanographical Section of the Deutsche Seewarte. According to the last annual report of the Deutsche Seewarte of Hamburg, the Oceanographical Section, which was founded on April 1, 1912, engaged in the following activities during the past year under the direction of Dr. G. Schott: (1) an investigation of the specific gravity of the water in German harbors and estuaries; (2) completion after ten years of the work

on the Atlas of the Currents of the Indian Ocean, which will comprise 24 plates; (3) the preparation of maps and diagrams from the oceanographical observations of the cruise of the *Möwe* to German Southwest Africa in 1911; (4) courses of instruction in oceanography; (5) the grant of subsidies to L. Mecking of Göttingen (now of Kiel) and R. Lütgens of Hamburg for research; (6) critical examination of several sheets of the Carte Générale Bathymetrique des Océans, issued under the auspices of the Prince of Monaco; (7) inception of studies, designed to cover a long period, for the preparation of an Atlas of the Currents of the Atlantic Ocean, beginning with an examination of the leeway records of sailing vessels deposited in the archives of the Seewarte; and (8) continuation of the collecting of surface temperatures of the North Sea for the Bureau du Conseil International pour l'Exploration de la Mer in Copenhagen (*Petermanns Mitt.*, Nov., 1913, p. 266).

PERSONAL

Mr. James I. Craig has been transferred from the Directorship of the Meteorological Section of the Survey Department, Cairo, Egypt, to the Comptrollership of the General Statistical Department. His successor in the Meteorological Section is Mr. H. E. Hurst.

Professor W. M. Davis of Harvard University has lately returned from a month in England and Ireland. He gave four lectures before the School of Geography at Oxford on "The Principles of Geographical Presentation," and addressed the Junior Scientific Club of Oxford University and the Sedgwick Club of Cambridge University on "Theories of Coral Reefs." In Dublin he gave three lectures in the Royal College of Science on certain problems in physical geography, illustrative of the explanatory method of geographical description. At Wellington and at Winchester "colleges"—public schools of the English type—as well as at Oxford, Cambridge and Dublin, he repeated his illustrated lecture on "The Lessons of the Colorado Canyon." During a brief visit to Paris he saw four of the French members of the Transcontinental Excursion or 1912, and received from them a beautiful album containing portraits of the European members.

Mr. Douglas Freshfield, the distinguished alpinist and Vice-President of the Royal Geographical Society, called at the house of our Society on December 12. He spent a few days in New York and was ending a trip around the world, crossing North America from west to east.

Dr. W. Hunter Workman and Mrs. Fanny Bullock Workman read papers before the Royal Geographical Society on November 24, on their exploration of the Siachen or Rose Glacier in the Eastern Karakorams in 1913 and their discovery of the peak 24,350 feet high which has been named after the Queen of England.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

Au Pays des Peaux-Rouges. Six ans aux Montagnes Rocheuses. Monographies indiennes. Par P. Victor Baudot. 238 pp. Ills. Soc. Saint-Augustin, Lille, 1911. Fr. 1.50. 10 x 6½.

An amusing feature of this work is not fairly to be charged to the author. Manifestly his publisher was in possession of a stock of old wood cuts and employed them somewhat at random for illustration. Father Baudot began his six years' missionary labor in the Rocky Mountains no longer ago than 1902. He illustrates the arrival at New York with a picture of the Sixth Avenue Elevated operated with the once familiar little engines. To exhibit railroad travel there is a Pullman diner of an early epoch. The sketches of Father Baudot's service among the Indians are merely a trifle. Of greater value is a monograph on the Blackfeet translated from the Italian manuscript of Father Prando which contains some important information. A similar essay on the Cœur d'Alenes has been translated from the Italian of an anonymous priest in the "Civiltà cattolica." These two form a valuable contribution to the ethnology of the two tribes and it is a fortunate chance that has brought them together for permanent preservation where they can be accessible to students. WILLIAM CHURCHILL.

Baltimore, Its History and Its People. By various contributors. Clayton Colman Hall, General Editor. Vol. 1: History. 721 pp. Map, index. Vol. 2: Biography. 488 pp. Vol. 3: Biography. 489-936 pp. Ills., index. Lewis Historical Publishing Co., New York, 1912. $25. 3 vols. 10 x 7.

The history of the city fills the first volume and is a useful compilation. The two other volumes are given to biographies with portraits of men who have had a part in the upbuilding of the city.

Early Days in Kansas. In Keokuk's Time on the Kansas Reservation. Being various incidents pertaining to the Keokuks, the Sac & Fox Indians, (Mississippi Band), and tales of the early settlers, life on the Kansas Reservation, located on the headwaters of the Osage River, 1846-1870. Green's Historical Series. 68 pp. Ills. Charles R. Green, Olathe, Kansas, 1913. 50 cents. 8½ x 6.

Homely and unpretentious records of pioneer days on the frontier of white settlement. A worthy addition to the chronicles of that time.

The Indians of the Terraced Houses. By Charles Francis Saunders. xx and 293 pp. Map, ills. G. P. Putnam's Sons, New York, 1912. $2.50. 8½ x 5½.

So far as this book is narrative it will be read with great pleasure, for the Indians of the pueblos in New Mexico and Arizona have always possessed an interest far greater than the nomads of the prairies. In their culture we find the beginning of a social economy which exhibits the aboriginal of this land as advancing toward a higher social level. Mr. Saunders has visited all the inhabited pueblos and has given the notes of his personal impressions. He does not pretend to the careful investigation bestowed upon the sedentary Indians by Cushing and Bandelier, to mention but two in a small and distin-

guished group of ethnologists. In fact his observations are essentially cursory and at times trivial, yet none the less they will serve the useful end of introducing Hopi and Zuñi and Moki to those who might otherwise remain in ignorance but who through this introduction may be led to continue the study in the better material which the Bureau of American Ethnology has made available in rich measure. When, however, he turns to comment upon the present system of Indian education in the pueblos he enters debatable ground. It is probably quite true that government schools are altering the life of the pueblos and that there is a loss of picturesque value in the course of progress. The best friends of the Indians will hold that mere picturesque value may properly be sacrificed for more wholesome surroundings in the community homes and that the undeniable industry of these Indians will be productive of better results when intelligently directed. WILLIAM CHURCHILL.

Greeks in America. An Account of their Coming, Progress, Customs, Living and Aspirations. With an historical introduction and the stories of some famous American-Greeks. By Thomas Burgess. xvi and 256 pp. Ills., index. Sherman, French & Co., Boston, 1913. $1.35. 8 x 5½.

Thirty years ago there were scarcely any Greeks in the United States; to-day, over 250,000 of them are here. But though they left their homes to come here, yet love for their native land burned strong within them as is shown by the fact that from 40,000 to 50,000 sailed from America to join their countrymen in the Balkan War.

Mr. Burgess tells briefly the story of Greece; refers to the various ways in which Greek immigrants to this country earn money; describes the Greek societies, newspapers, books, families, schools, celebrations and rites, the daily life of the Greek in our large cities, mill towns, and western states; and lastly gives a sketch of Michael Anagnos, and other Greeks who have become famous in America.

The author says the idea is erroneous that the Greek comes here merely to earn money and then return home. He says that the Greek immigrant, even though he may revisit his native land, will eventually return to America. Mr. Burgess makes some suggestions as to what to do for and with the Greek immigrant. A table gives, by states and cities, the approximate number of Greeks in the United States, and there is a bibliography of the best books in English on modern and medieval Greece and on Greeks in America.

WILBUR GREELEY BURROUGHS.

Highways and Byways from the St. Lawrence to Virginia. By Clifton Johnson. xi and 340 pp. Ills. The Macmillan Co., New York, 1913. $1.50. 8 x 5½.

The rural life of the country is vividly described, both by the author and by means of conversations which he reports verbatim in the local dialect. These conversations help us to understand the mannerisms, customs, modes of living, legends and superstitions of these people. Appended to each chapter is a brief descriptive and historical account of places of scenic and historic interest, with directions how to reach them; also, a statement of the condition of the roads relative to motoring, distances from points of interest to near-by cities, etc. The book should be of value to all who are planning vacation trips either by rail, or motor. WILBUR GREELEY BURROUGHS.

Le Juif Errant d'Aujourd'hui. Étude sur l'émigration des Israélites de l'Europe Orientale aux États-Unis de l'Amérique du Nord. Par L. Hersch. 331 pp. Diagrams. M. Giard & É. Brière, Paris, 1913. Fr. 6. 9 x 5½.

It is well that this timely essay upon one of our social themes comes to us from a student who can bring an unbiased mind to the source and to the destination of the great Jewish migration of the present. It amounts to a great folk movement, its causes in social conditions of eastern Europe, its result a great economic problem in American communities. Upon this ultimate of the theme Dr. Hersch makes little comment. His work is concerned with the movement at its several sources, he examines its causation in careful detail,

ıe records the fluctuations and discloses the reasons therefor. The value of the work is that he brings the objects of his study as far as Ellis Island, where ve shall have to make a disposition of the material. For the richer knowledge of this particular class of future citizenship, an immigration which comes to stay, our students of social problems will turn gladly to this work as a standard handbook. The treatment is particular where tables and detailed statements are seen to serve the end of a data supply, but it is broad in a wide view of history and political economy, a very valuable and wholly interesting treatise on a theme which we are forced to study in our own civic life.

WILLIAM CHURCHILL.

The Old Boston Post Road. By Stephen Jenkins. vii and 453 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1913. $3.50. 9 x 6½.

The habit of mind which has given their great value to earlier works by Mr. Jenkins may, in the most kindly sense, be described as parochial. He was essentially an antiquarian, indefatigable in his research into the affairs of the little district about his home. It is just because of this parochialism which gave the charm to his studies of Broadway and the Bronx that this volume falls far below the level of its predecessors both in interest and in value. Hitherto he has been dealing with distances of a few miles, such as could be covered by a leisurely nag ambling along familiar roads and sure of the home stable at night. Here he essays the greater distance and it proves too much for the method. There is much interesting antiquarian material about the main highway between New York and Boston; it would enliven a less entertaining volume just to have the extracts from Madam Sarah Knight and her comment that "I made but one Grone, which was from the time I went to bed to the time I Riss." But when he has passed Stratford and gets into the unfamiliar country of the Yankees the personal acquaintance vanishes, and with it goes the peculiar charm of his writing.

CENTRAL AMERICA AND WEST INDIES

Die mittelamerikanischen Vulkane. Von Karl Sapper. 173 pp. Maps, index. *Ergänzungsheft No. 178 zu Petermanns Mitt.* 1913. Mk. 12. 11 x 7½.

This is a comprehensive general report upon the volcanoes of Central America by the eminent German volcanologist, whose personal study of the region has extended over twelve years and included reconnaissance examination of nearly all important vents of the region. Not only his own data but those of all other workers are made use of in this summary report. The first part (127 pages) is devoted to detailed descriptions of the individual volcanoes; the remaining 45 pages, which compose part II, being given over to a general treatment of the subject.

As regards the distribution of the Central American volcanoes, Professor Sapper finds that they are arranged upon fissures, and that of the 101 volcanic mountains and *Maare* of the first order, the majority range themselves in beautifully expressed series which are parallel to each other and nearly parallel to the nearby coast of the Pacific ocean. To the southward, however, certain volcanoes fall in a distinct class connected with mountain arcs of the Pacific type to which they are parallel. Excepting this class, the Central American volcanoes, as already stated, are found in long, nearly parallel lines, which instead of being perfectly straight, are made up of zig-zags, or else they fall in short transverse lines nearly at right angles. The individual series are offset *en échelon* and throughout in the same sense. This peculiarity of regular arrangement taken in connection with results of his earlier studies of the eruption and earthquake of Santa Maria in 1902, leads Sapper to believe that this eruption was due to the sinking of a local block of the earth's shell, and that the group of Central American volcanic vents have been opened along the margins of similar blocks which have undergone settlement in succession, though separated by considerable time intervals. The order of settlement is believed to have been from the southeastern blocks toward the

northwestern. The faults which separate the blocks of the system are believed to have been formed without control by the more ancient faults of the region. This conclusion has much in common with views which have been held concerning the movement of blocks of the earth's crust within the Great Basin of the western United States (Clarence King), and in Iceland as well (Thoroddsen).

The greater number of Central American volcanoes are cinder cones often with deep radial barrancoes whose present shape and magnitude are believed to express the result of some decades of erosion. Upon the flanks of the larger cones there are, however, in many cases, parasitic cones, and these are seldom arranged in straight lines and apparently never along radial lines. Many of the larger volcanoes, in common with those of Mexico, show in place of true parasitic cones, a larger or smaller number of cones of much the same dimensions which do not rest upon the flanks of the principal mountain but are found in its vicinity. Being obviously in causal association with the larger mountains these smaller satellites are described as ''companion volcanolets'' (*Begleitvulkänchen*). Whenever a strong wind was blowing during an eruption the parasitic cone which has resulted has attained a greater height upon the windward (western) side and the projectiles have been carried much farther to leeward.

Outflow of lava has played a large rôle in the formation of many volcanoes, and these composite cones upon being dissected by erosion present the lava flows as great ribs which stand in relief. If the main crater wall is found ruptured in more than one place, the breaks are generally two in number, opposite and in the direction of the longer axis of the cone.

Maare, the exceptionally low and broad craters, are especially numerous in Central America, but whether they are due to explosive eruptions or to infall, Sapper has been unable to determine.

As regards the materials exuded or ejected, these are found to be for the most part andesites and basalts, the latter generally a later product. Quartz, porphyry, diabase, porphyrite, and dacite become important in Nicaragua.

The great backbone of mountains and the blanketing masses of andesite, rhyolite and basalt in Central America are to be regarded as the products of gigantic fissure eruptions which took place in Tertiary and particularly in Oligocene times. The more modern eruptions in Central America began in the Quaternary and developed successive periods of culminating intensity. In Nicaragua particularly these have resulted in important changes in the coast line, in the stream net-work, and in the surface relief of the country; though the modern period of activity must be accounted as small in comparison with that of the Tertiary, and the historic eruptions as relatively few in number. The paper closes with a valuable chronological list of the volcanic and seismic phenomena which are on record for the Central American region, this list being expanded from that of de Montessus.

WILLIAM HERBERT HOBBS.

History of the Discovery and Conquest of Costa Rica. By Ricardo Fernández Guardia. Translated by Harry Weston Van Dyke. xxi and 416 pp. Maps, ills., index. T. Y. Crowell Co., New York, 1913. 8½ x 6.

The stories of Spanish conquest in the new world bring to light characters who met the ordeals of the strange land with fortitude. While now and then a leader turns out a rascal, the heroic and the just outnumber the degenerate, and histories of the various periods of expansion are inspiring. This is particularly true of this account of the early settlements in Costa Rica. The author has delineated the characters and lives of many brave conquistadores of the sixteenth, seventeenth and eighteenth centuries. The opening chapter gives a brief account of the geography of the land and prepares the reader for the strife of conquest by accounts of the five indigenous races which though never large in number were able to harass the Spaniard for three centuries. Then follows the story of a great array of Spanish leaders who in one way or another, inspired by high ideals or a lust for gain, penetrated this unpromising land to the south. ROBERT M. BROWN.

SOUTH AMERICA

Die Cordillerenstaaten. Von Dr. Wilhelm Sievers. Sammlung Göschen. 1. Bändchen: Einleitung, Bolivia und Perú. 148 pp. Maps, ills., index. 2. Bändchen: Ecuador, Colombia und Venezuela. 123 pp. Maps, ills., index. G. J. Göschen, Berlin, 1913. 90 pfg. each. 6½ x 4½.

Professor Sievers has done a painstaking piece of work in regional geography in these two volumes on the countries of the South American Cordillera. The extremely fine print of a large part of the first volume leaves the reader's eyes and patience almost exhausted, and is not a dignified form in which to cast such good results. One cannot find elsewhere so judicious and at the same time so clear a treatment of Bolivia and Peru, the two countries, which, with Venezuela (an old field of work for Professor Sievers), get the lion's share of the space.

After a brief general description of a country, there are compact explanations of the physiography and climate of each natural region. Then follow excellent summaries of the effects of these physical conditions upon the vegetation and the people. These summaries reflect the author's wide reading, as well as his familiarity with both physical and anthropogeographic principles. To take a few illustrations. There is in no English book so excellent a description of the zone of vegetation on the coast of Peru, between 8° and 18° south latitude, in the so-called "Lomas" belt. Yet it is one of the most important and certainly one of the most fascinating features of Peru, set, as it is, between an upper and a lower desert. One may ride, as did the reviewer, from the upper "pampa" (in some places from the mountains) into the coast range and down into the zone of rains, 2,000-5,000 feet above the sea, and come out again into the lower desert, in less than three hours. From barren sand into luscious wild clover, knee-high; from warm, dry air to cool, saturated air and heavy showers; from a blazing sky to clouds and dense fogs—these are the contrasts between the Lomas and the belts of country on either hand.

Of similar character are Professor Sievers' distinctions between the forested Beni country in northern Bolivia and the country of the Missions farther south where grassland and forest alternate. There are many such illustrations of the thorough scholarship of the author. Where else than in Germany could one have all this published for less than twenty-five cents? The series of which these tiny volumes form a part deserves to be well known among the growing number of American geographers to whom German is no longer a convenience but a necessity. ISAIAH BOWMAN.

AFRICA

Die deutschen Schutzgebiete in Afrika und der Südsee 1911-1912. Amtliche Jahresberichte, herausgegeben vom Reichs-Kolonialamt. xvii and 370 pp. E. S. Mittler & Sohn, Berlin, 1913. Mk. 11.50. 11 x 7.

This official compilation has two merits worthy of note in connection with public statistics: 1: It is promptly issued, and this means that the figures are available while yet valuable. 2: The tables have been carefully digested for use. They are all summation records and comparisons with the summations of preceding years; they are the aggregate figures of population, justice, education, agriculture, trade anad communications. They are logically presented for East Africa, Kamerun, Togo, German Southwest Africa, German New Guinea and Samoa. For each of these colonies there is a brief introductory essay setting forth the activity of the year for which the report is made. The soundest commentary which can be made upon this report is that it is entirely contained in 370 pages, practically a page a day for the record of a year of a great and widely extended empire.

La France en Afrique. Par Edmond Ferry. 301 pp. Armand Colin, Paris, 1905. Fr. 3.50. 7½ x 4½.

The policy of the French in African colonization is the theme of this book. The author first reviews the advent of Napoleon in Africa and describes his diplomatic and crafty scheme of winning Africa for France by a seeming

deep interest in the religion of the country. It is inferred that the present plan of making headway for France in the country is based on the plans of Napoleon in 1798. The general characteristics of the area, the distinctive traits of the nomad population, the plan of interesting the inhabitants in works of improvement, the task of reconciling all acts to the religion of the natives and especially the difficulties with the inner court of Mohammedanism, the Senoussi, are subjects which the author carefully discusses; and the principles which the French are planning to follow as the basis of their civilizing work in Africa are stated. ROBERT M. BROWN.

Hunting the Elephant in Africa, and Other Recollections of Thirteen Year's Wanderings. By Captain C. H. Stigand. With an Introduction by Colonel Theodore Roosevelt. xv and 379 pp. Ills., index. The Macmillan Co., New York, 1913. $2.50. 9 x 6.

The title is not exactly adequate, for the book treats not only of elephant hunting but also of the rhinoceros, lion, buffalo, and bongo (a large antelope), with hints on camping and chapters on African rivers and swamps, native servants, hunting incidents, African sayings and ideas, African insects and some other topics. The work will take its place among the best of hunting books. The author is a distinguished and experienced Nimrod and field naturalist; few others have his large experience and his book is full of suggestions for other hunters. He does not pin full faith to the doctrine of protective coloration and shows that it does not play the smallest part in concealing most of the big game of Africa from their foes.

L'Oasi di Ghat e sue Adiacenze. Di Capitano Bourbon del Monte Santa Maria. 178 pp. Maps. Unione Arti Grafiche, Castello, 1912. 7½ x 5.

L'Islamismo e la Confraternita dei Senussi. Di Capitano Bourbon del Monte Santa Maria. 247 pp. Map. Unione Arti Grafiche, Castello, 1912. 7½ x 5.

The information in the first book is of a geographical and military character. The region is shown in the state in which the Turks abandoned it, and the difficulties of the Italians in attempting to restore order patterned on European ideas are mentioned.

The second contains an account of the origin and growth of the order of the Senoussi and its relation to Islam. The writer seems imbued with the spirit prevailing in French colonial circles where alleged anti-European or anti-Christian doings of the order are exaggerated, often for political purposes. He would have been nearer the truth had he tried to show that the order need not be considered a menace to the expansion of European dominion in Africa. The case of Egypt can be adduced as an example. An instructive map shows the distribution of Senoussi centers in Northeastern Africa. LEON DOMINIAN.

Notes Ethnographiques sur les peuples communément appelés Bakuba, ainsi que sur les peuplades apparentées. Les Bushongo. Par E. Torday et T. A. Joyce. Maps, ills., index. 291 pp. *Ann. du Mus. du Congo Belge,* Tome 2, Fasc. 1. Falk fils, Brussels, 1910. 14 x 11.

We have here a very detailed and careful study of the Bushongo race of the Belgian Congo as manifested in one of its ramifications, the Bakuba people. Rigidly pursuing a method which makes for great accuracy of observation he has written in this report a record of the people which will leave scant gleanings for those who come after. While giving deserved praise to the definitely ethnological work in this volume it is permissible to record a note upon the linguistic collections. There is presented a very large mass of vocabulary material of the Bushongo and the Lumbila arranged after the usual manner. When we reflect upon the great strides made in ethnography, largely by reason of the Cambridge system of learning what to observe, we must feel that the time is ripe for a similar syllabus of the

system of languages below the inflected class so that it may be made possible to coordinate the large mass of vocabularies. Nothing can be more clear than that these vocabularies result in clouding confusion so long as the collectors are wholly untrained in the grammatical life of the speech of isolation and agglutination. WILLIAM CHURCHILL.

Anthropological Report on the Ibo-Speaking Peoples of Nigeria. By Northcote W. Thomas. Part I: Law and Custom of the Ibo of the Awka Neighbourhood, S. Nigeria. 161 pp. Maps, ills., index. Part II: English-Ibo and Ibo-English Dictionary. vi and 391 pp. Part III: Proverbs, Narratives, Vocabularies and Grammar. vi and 199 pp. Harrison & Sons, London, 1913. 9 x 6 each.

These volumes, with the companion study of the Edo (*Bull.*, Vol. 44, p. 697) by the same author, illustrate the growth of the difference in European attitude toward the affairs of Africa. From the same region we note the first essay toward the comprehension of the African, the slim pamphlet published in Boston under mission auspices more than two generations ago, the grammar and vocabulary of the Yoruba. Ibo and Edo are now seen to be rather considerable language groups included within the area formerly classed as Yoruba, and so far as we may determine from the evidence which Mr. Thomas has presented in these very satisfactory dictionaries, the differences between Ibo and Edo on the one hand, and on the other between these languages of the lower Niger and the true Yoruba of its upper course, are far greater than may be assigned to dialectic variety. As in the case of his former study of the Edo we are impressed by the author's caution in his record of Ibo life and custom. In every note of manner and custom he is sedulous to differentiate that which he has seen, the interpretation which he makes of the thing seen, the explanation which he has received from his Nigerian companions and a further comment upon the evidential value of such testimony. The method does not make for a smooth and entertaining narrative, in fact the result is remarkably arid; but the veracity of these notes is so highly substantiated as to serve as the best apology for the absence of pictorial value. Students of folk lore will find in one of these volumes a great treasure of animal life. The principal hero is the tortoise, but the myth series is clearly of that kingdom of sentient beasts which has been introduced to this country by servile Africans and which only lately has been considered worthy of collection and study. WILLIAM CHURCHILL.

ASIA

Studies on the Vegetation of the Transcaspian Lowlands. By O. Paulsen. The Second Danish Pamir Expedition. Conducted by O. Olufsen. 279 pp. Map, ills. Gyldendalske Boghandel, Copenhagen, 1912. Kr. 4. 10 x 7.

Work of this character passes far beyond the botanical record upon which it is based. It is really the study of the vegetal control of secular geographical mutation. It is regarded as so important that one of the major projects of the research authorized by the Carnegie Institution is the maintenance of a desert laboratory in Arizona and the conduct of expeditionary investigation in the more characteristic desert formations of the world. We prefer to examine this interesting treatise in reference to this phase of geographical study. Transcaspia is a margin of that central Asian desert which we find reason to believe has been for centuries advancing upon the area of tilth. In several recent works such as Sir Aurel Stein's "Desert Cathay" and Tate's "People of Seistan," we have abundant evidence that man recoils from the struggle with the aeolian advance of the desert; the whole theme has been carefully treated by Ellsworth Huntington in his study of desiccation which, debatable in some details, is commonly accepted in general. Here we find the direct evidence of the struggle of nature to resist the march of the desert, the development of resistent qualities in vegetation which may cope with desiccation and the loss of humus, the root search for water of the underflow

and stem toleration of the efflorescent salts, the binding of shifting masses of sand. In so far as the agencies at work are vegetal this work is botanical, but in the result accomplished the work is a close study of the factors which establish geographical land forms. WILLIAM CHURCHILL.

An Outline History of China. Part 2: From the Manchu Conquest to the Recognition of the Republic, A.D. 1913. By Herbert H. Gowen. 216 pp. Index. Sherman, French & Co., Boston, 1913. $1.20. 8 x 5½.

As noted in the review of the former volume (*Bull.*, Vol. 45, p. 695) Professor Gowen selected the fall of the Ming dynasty in the middle of the seventeenth century as the demarcation between ancestral and modern China. In this final volume is embraced the whole span of the Manchu empire from the accession of the infant Shun Chih to the downfall of the infant Pu Yi. From its start to its finish the Manchu hold upon the dragon throne has been the feeble clutch of baby hands, the real rule has been exercised by palace favorites and scheming captains of a turbulant military. Regarded as a whole, the plan of the work is excellent, it outlines the history of a large yet never great empire, it furnishes the framework upon which the student may adjust the greater works which deal with episodes of Chinese history.

Die chinesische Weltanschauung. Dargestellt auf Grund der ethischen Staatslehre des Philosophen Mong-dse. Von Heinrich Mootz. x and 205 pp. Ills. Karl J. Trübner, Strassburg, 1912. Mk. 4. 8 x 6.

The Mong-dse of the title is better known under his latinized designation of Mencius, the successor of Confucius. The propriety of sacrificing such little stock of information as exists in Caucasian minds associated with the name Mencius merely to conform with one of the Chinese vernaculars is problematical. If the same effort were made in the case of Melanchthon and Erasmus we should consider the loss irreparable. The author in addressing a popular audience has dealt very wisely with the philosophy of Mencius, essentially a homespun thinker offering rules of propriety to a people whose instinct has crystallized through ages of such teaching to a passion for self-control in the mass. He has selected with no little care the most characteristic of these apothegms, has translated them with considerable appreciation of their social value and has added comment to each group of dicta which shall serve to express the passage from the sometimes cryptic aphorism to its employment in the affairs of life and their good conduct. Of course there is much in the philosophy of Confucius and Mencius which escapes our sympathy even if we may acquire it in rather cold comprehension, but Mr. Mootz has selected for this volume only those rules of life which manifest a strong appeal to our common humanity. The result is quite satisfactory as an introduction to the manner of Chinese thought. WILLIAM CHURCHILL.

Kêng Tschi T'u. Ackerbau und Seidengewinnung in China. Ein kaiserliches Lehr- und Mahn-Buch. Aus dem Chinesischen übersetzt und mit Erklärungen versehen von O. Franke. vi and 194 pp. Ills., index. *Abhandl. Hamburg. Kolonialinst.*, Vol. 11. L. Friederichsen & Co., Hamburg, 1913. Mk. 20. 12 x 9½.

We have here a very sympathetic handling of one of the great Chinese classics whose history is traceable to the middle of the twelfth century. Dr. Franke presents the Chinese text with a clear translation and a reproduction of the traditional pictures. In itself a great and valuable work the author has added a wealth of critical and illustrative material which amply serves to introduce this important work to the Occidental mind with an appreciation of the part which it has played in developing the culture of China. Thrift is but the first of the virtues which it inculcates, the wise use of all the materials which are ready to hand, the correction of waste. It teaches by daily lessons the value of industry and the importance of working early and late. Text and picture show the part which each one in the household must perform in the field and in the warm room where the silkworms hatch and spin; the children are taught what service they must render to lighten the work of those

a little older, the active workers deriving help from the younger turn the product of their family labor over to the patriarch who shall turn this product in the market to the profit of the family. And with what period of our own culture does this highly organized community life correspond? In the middle of the twelfth century cultivation in England was so little developed that the land was always at the edge of dearth, and famines in poor seasons carried off thousands, wolves ravened up to the gates of London and York and destroyed kine and men. WILLIAM CHURCHILL.

Five Years in Unknown Jungles for God and Empire. Being an account of the Founding of the Lakher Pioneer Mission, its work amongst (with Manners, Customs, Religious Rites and Ceremonies of) a wild, Head-hunting Race of Savage Hillsmen in Further India, previously unknown to the Civilized World. By Reginald A. Lorrain. xii and 264 pp. Map, ills. Lakher Pioneer Mission, London, 1913 (?). 5s.

The small sum of geographical information supplied may be found in the rough sketch map. The Lakherland, where the author established his mission, lies in Farther India inland from Arakan and practically occupies the whole of the great bend of the Kolodyne River. The book has been written to secure funds for the prosecution of the work which the author assumed without the sanction of any of the regular mission establishments of Great Britain. The appeal seems addressed to a particularly simple form of religious life, for the author certifies to his divine call to this wild field by reciting his success with the *sortes biblicae*, against which, if we recall correctly, there is a law on the statute rolls of Great Britain. It may be recalled that among the Christians of the Middle Ages the Bible was often opened at random or by a pin inserted between the pages, and the first passage striking the eye was accepted as a special message. Such chance selections were called *sortes biblicae*.

The Pagan Tribes of Borneo. A Description of Their Physical, Moral and Intellectual Condition with some Discussion of Their Ethnic Relations. By Charles Hose and William McDougall. With an appendix on the physical characters of the races of Borneo by A. C. Haddon. Vol. 1: xv and 283 pp. Vol. 2: x and 374 pp. Maps, ills., index. Macmillan & Co., London, 1912. 42s. 9 x 6.

The designation pagan is used in contradistinction to Mohammedan in this work. Ethnically the reference is particularly to the Kayans, the Kenyah, the Klemantans, the Ibans or Sea Dyaks, and the Punans of the interior. Geographically we find these peoples established in North Borneo and Sarawak, the northwestern face of the island. Dr. Hose in particular has a most intimate acquaintance with the people of his study, for he has served a quarter of a century in the civil administration of Rajah Brooke. The second author, Dr. McDougall, came to Sarawak as a member of the Cambridge Torres Straits Anthropological Expedition; therefore he brought to the elaboration of his fellow author's material a technical training in anthropology which proves of value in standardizing the more intimate observation derived from daily life in contact with the pagan tribes.

I have expressed the opinion before as to the anthropological training in England now in fashion. It does seem that there is too great proof of the somewhat mechanical effort to reduce all rude life to rigid conformitiy with Frazer's "Golden Bough." In the hands of mere pupils this effort deadens freedom of thought. In England, particularly in Cambridge, each anthropologist seems, with a slight variation upon a classic phrase, *unius addictus in verba jurare*, and that one Frazer. However, the vigor of the senior author's intimacy with these tribes, even the shy Punans of the inner mountains, serves largely to correct the result which might have been expected and which in several chapters does appear. The two volumes are crowded with the most interesting details and we must be thankful that it has been possible to preserve such a record before the old life had been civilized out of existence. Dr. Hose insists so earnestly upon one detail of Borneo life that it is only fair to carry on the substance of his note upon a point which has moved him to righteous wrath in behalf of maligned savages. He wishes the world to

know, despite current opinion most recently voiced by Keane, that the young ladies of Borneo do not ask of their swains that they earn their favors by bringing home fresh heads in a basket. The heads, it appears, are brought home, but not for the girls. Where so much is excellent, so much is wholly new, and where we acknowledge with lively satisfaction an interest maintained unflagging through 600 pages and 200 magnificent pictures, it may seem ungenerous to offer an adverse suggestion. Many of the observations are worked out to the most minute detail, yet the observers seem to have neglected the interpretation. For example, the tattoo. There is an enormous mass of detail, the life history of the design has been gathered from the tattooed by the elder author and studied out by the other in conformity with Dr. Haddon's theory of the evolution of ornament. Yet neither seems to have recognized that the design is both indicative and decorative of that function of life which is among the savages a dominant instinct. WILLIAM CHURCHILL.

Gennem Wahhabiternes Land paa Kamelryg. (Through the Country of the Wahhabites on Camel's Back). Af Barclay Raunkiær. 304 pp. Maps, ills., index. Gyldendalske Boghandel, Copenhagen, 1913. 8½ x 6.

In the winter of 1911-1912, Mr. Barclay Raunkiær went through Eastern and Central Arabia, mostly on new tracks, from Koweit by Bereidah, Riadh and Hofuf, reaching Adjer on the Perisan Gulf in April, 1912. The land is divided in long belts, stretching NW-SE. A low rolling desert plain with some "mesas" of sandstone extends along the Persian Gulf. To the west it is bordered by a sandstone plateau, 90 miles broad. This stony desert passes westward into a belt of sand-dunes, 20 miles broad. Then follows the Central Arabian highland, which is composed of great sandstone blocks, tilted towards the east. The borders of the plateaus are deeply intersected by dry "wadies" which sometimes carry water after heavy showers. The oases are entirely dependent on the ground water in the depressions. Many oases show evidence of decay, partly due to destruction by hostile invaders, partly to increasing dryness. The settled population is restricted to these oases, Nedjid and Hasa. The houses are built of clay, with flat roofs, very rudely made. Agriculture is limited to the growing of date palms, wheat and barley. Irrigation is necessary. Goats and sheep are common, a hump-backed zebu cow is rarely met with. All communication is carried on by camels and donkeys. There is practically no industry in central Arabia, and the export is limited to raw hides and wool.

The nomadic tribes spend the dry summer in the neighborhood of some wells; during the winter the steppes offer a scanty pasturage, and their flocks —sheep, goats and camels—then sweep over vast areas.

Eastern Arabia is divided in four political divisions, the Turkish province El-Hasa and the independent "states," Hail, Riadh, and Koweit. Riadh is the capital of the "imam" of the Wahhabites. Koweit, at the head of the Persian Gulf, is the principal port of all central Arabia. It is closely allied to England, which thus commands the terminus of the Bagdad railway.

Mr. Raunkiær suffered many hardships and severe illness; and several times only just escaped being killed by fanatics. We must admire the stubborn perseverance that enabled him to force his way through this inhospitable desert, and to do scientific work also, greatly extending our knowledge of this part of the world, under very unfavorable conditions. The expedition was organized by The Royal Danish Geographical Society. W. WERENSKIOLD.

AUSTRALASIA AND OCEANIA

The New World of the South: Australia in the Making. By W. H. Fitchett. xiv and 402 pp. Index. Charles Scribner's Sons, New York, 1913. $1.75. 8 x 5.

Australia was placed on ancient maps long before it was actually discovered, or any ship had sailed the waters of the Pacific. And so, starting with these maps and the theories on which they were based, Mr. Fitchett begins his narrative. He continues down through the history of the discovery

and early exploration of the coast of Australia; the early settlement of the continent; the system of transportation of convicts from England; convict risings against the government; the political revolution; the cruel war between the whites and blacks of Tasmania and how Robinson, a Christian bricklayer, alone, through friendship, brought in the native tribes in surrender after 5,000 armed whites had toiled in vain to accomplish this end; the exploration of the interior of Australia; and, lastly, an account of the bushranger, a picturesque but bloody type of bandit. Throughout the book the character of each of the men, whether prominent in exploration, government or brigandage, is brought out clearly and distinctly. The author writes in a fascinating manner. There is not a dull or stupid page in the book.

WILBUR GREELEY BURROUGHS.

EUROPE

The Continent of Europe. By Lionel W. Lyde. xv and 446 pp. Maps, index. The Macmillan Co., New York & London, 1913. $2. 9 x 5½.

There are few books in English in which the control or influence exerted upon man and his enterprises by geographical relief, climate and other natural factors is so emphasized on every page as in this volume. Professor Lyde has for some fifteen years been a conspicuous writer of texts and books on geographical education. The present volume associates with facts their full geographical significance. It deserves a place in the libraries of all teachers of our study, not only for its explication of the geography of the continent and states of Europe but also as an example of fine geographical method.

Die Lage der Deutschen Grossstädte. Von Dr. Albrecht Penck. 38 pp. *Städtebauliche Vorträge aus dem Seminar für Städtebau an der kgl. tech. Hochschule zu Berlin,* Vol. 5, No. 5. W. Ernst & Sohn, Berlin, 1912. Mk. 2.

In the development of German cities, location plays an important part in two ways. The first is the "Ortslage" or local situation inviting or repelling settlement; the second, the "geographische Lage," geographical location. Local conditions making a favorable *Ortslage* are, for example, a bluff on a navigable river (Cologne, Magdeburg); islands that make a river easily fordable (Berlin, Frankfort); the mouth of a tributary (Coblenz, Ratisbon), and the like. The "geographical" location comprises the influence of the wider neighborhood, which determines whether many people are likely to be attracted to such a locally favored spot; as, for instance, location on an important line of traffic, or near mineral resources, or other natural advantages. While the *Ortslage,* in most cases, furnished the stimulus for the founding of towns, it was geographical location which decided whether such a foundation was to become a metropolis or remain a small town, and also whether, having once been large, it should remain so always.

From this point of view the author presents to us a very interesting synopsis of the rise and decline of the most important German towns under the influences of local and geographical location. The many old and famous cities on the Rhine were founded as Roman *castra,* wherever there was a good *Ortslage,* by virtue of their geographical location on the left bank of the Rhine, in order to control the conquered territory beyond the river. But later, when the Rhine became a German river, with almost all of Germany east of it, that geographical location ceased to be favorable, and newer cities sprang up on the right bank, often directly opposite the old ones, to compete with them. Only those of the older cities continued to grow, which, in addition to their former advantage, possessed also another whose value began to show under the changed conditions: Cologne, for example, because it is located where the great continental road along the foot of the German Mittelgebirge crosses the Rhine, while Mainz saw her leading position wrested from her by Frankfort. The great ports of Germany (with the sole exception of Kiel) grew up at the head of ocean navigation on the large rivers, which was the favorable geographical location at the time of their foundation; but now the

favorable location is nearest the coast, so that on all these rivers new ports were built at their mouths creating a strong competition for the older places. In some cases, of which Hamburg is the most striking, permanency of location of large centers may be preserved. In other words, when a city, especially a commercial city, has grown to a certain size, too much capital is invested there to allow matters to go the natural way, so that every effort is made, regardless of cost, to preserve the former rank of the citiy. Hamburg spent millions on deepening and enlarging her harbor, so that now she has again reduced Cuxhaven to a port of secondary importance. Similarly, Leipzig, when Halle threatened to develop dangerous competition owing to changed political conditions, made the most strenuous efforts to revive her earlier supremacy, and succeeded.

In other cases, where the older city is not strong enough, such a struggle results in the creation of twin cities, such as Bremerhaven and Bremen, Heidelberg and Mannheim. A geographical location which may be called artificial is given whenever the will of a sovereign interferes with the purely geographical conditions. Thus Augsburg and Munich, both controlling important passes across the Alps, were rivals of equal importance all through the Middle Ages, until the rulers of Bavaria made Munich their capital, whereupon it quickly outstripped the sister city. Berlin and Magdeburg are another instance of the same thing. However, if the choice of the ruler is against nature, he will find nature stronger than his will, as was shown in the case of Ludwigsburg *versus* Stuttgart, where the old residence got the better of her new rival.

These few examples must suffice to show the method and points of view of the author, and also to show how interesting the "geography of places" can be when treated in a truly geographical way. M. K. GENTHE.

Germany of To-Day. By Charles Tower. Home University Library. 256 pp. Index. Henry Holt & Co., New York. 50 cents. 7 x 4½.

An unusual exposition of the present status of the German Empire. The early chapters are political in their aspect dealing with the functions and machinery of the Empire and the municipalities. A few chapters consider the aspects of education, the social and intellectual life, with fresh and vigorous treatment. The industrial life of the Empire is treated in two significant chapters, one on manufacturing, the second on agriculture, and together they give the crux of the German situation as it stands to-day. The author brings out well the great increase of manufacturing which is largely a recent development and the rapid decline of agriculture from 80 per cent. of the population at the beginning of the nineteenth century to less than 30 per cent. to-day. The book is to be highly recommended to those who desire a knowledge of the German Empire. ROBERT M. BROWN.

L'Espagne au XXe Siècle. Étude Politique et Économique. Par Angel Marvaud. xiv and 515 pp. Map. Armand Colin, Paris, 1913. Fr. 5. 8 x 5.

Commercial and economic geography is emphasized in this book. Many statistics are given, but as the author constantly insists upon deficiencies in Spanish statistical work, many of his conclusions might be taken with misgivings. He not infrequently contradicts himself and his general attitude towards his subject is that of a Frenchman and critic. Nothing is good in the unfortunate country; not even the climate finds grace. True it is that Spain is not exactly a paradise. The author's characterization of climate and soil as "arid" and not uniformly fertile is unfortunately true. As he says, the coast is not inviting to navigation and the largest streams partake of the nature of torrents rather than of rivers. With such natural drawbacks it is not easy for a people when emerging from nearly eight centuries of foreign rule and four centuries almost without peace to achieve, rapidly, material progress. This should be taken into consideration. Encouragement, not gloom, must be offered Spain, recognition of its efforts to remedy the errors of its past and to improve, even if timidly, the advantages of the present.

Mr. Marvaud signals every effort made in Spain for improvement but never fails to conclude that these efforts are hopeless. The only possibility he

sees for the salvation of the Spanish people is in education. This everybody will concede, and he himself acknowledges that much has been done lately in that direction. But such attempts require time, and there is no reason to despair of ultimate success because a few decades have not yet placed Spain, in this respect, on a level with other countries. The disheartening pessimism pervading the whole book may perhaps be partly explained by Spanish lack of sympathy for France, of which the author complains, although recognizing that the Spanish people are not wholly unjustified in their attitude.

AD. F. BANDELIER.

POLAR

Deutsche Südpolar-Expedition 1901-03 (Drygalski). Band 3 und 4: Meteorologie. Vol. 1, 1. Hälfte, No. 1: Meteorologische Ergebnisse der Winterstation des *Gauss*. Von. W. Meinardus, pp. 1-126; No. 2, pp. 127-339. 2. Hälfte, No. 1: Das Beobachtungsmaterial und seine Verwertung nebst Erläuterungen zum meteorologischen Atlas. Von W. Meinardus und L. Mecking. Die Luftdruckverhältnisse und ihre klimatischen Folgen in der Atlantisch-Pazifischen Zone südlich von 30° S. Br. 129 pp. Vol. 2, No. 1: Meteorologische Ergebnisse der Winterstation des *Gauss* 1902-03. (Tabellen). Von W. Meinardus. pp. 1-123. No. 2: Meteorologische Ergebnisse der Kerguelen-Station 1902-03 (Tabellen), pp. 127-242. No. 3: Meteorologische Ergebnisse der Seefahrt des *Gauss* 1901-03 und Ergebnisse der Luftdruckbeobachtungen der Internationalen Meteorologischen Kooperation 1901-04 (Tabellen), pp. 245-452. 1. Atlas Meteorologie, No. 1: Mittlere Isobarenkarten der höheren südlichen Breiten von Oktober 1901 bis März 1904. Diagrams and maps. G. Reimer, Berlin, 1909, 1911, 1913. 14 x 11½.

The memoir of W. Meinardus is an elaborate discussion of the meteorological observations made by the German Antarctic Expedition. Numerous comparisons with observations made by other South Polar expeditions, and the great care with which all details were studied, led Meinardus to many interesting results. A simple enumeration of the problems discussed would occupy many pages. Meinardus has treated his subject with a master hand. Only in a few instances does one feel inclined to criticise his statements. An interesting part of the report is Meinardus's interpretation of the general atmospheric circulation in the South Polar regions.

The memoir of L. Mecking deals with the distribution of atmospheric pressure south of 30° S. and the influence of seasonal barometric changes upon the Antarctic meteorological phenomena. The material upon which Mecking's discussion is based was gathered by international cooperation during the years 1901-1904. Those who attended the Geographical Congress of Berlin in 1899 and remember the discussions and especially Sir Clements Markham's speech, will understand why this "international cooperation" was predestined to be unsatisfactory.

G. Neumayer, who played such a predominant rôle in the organization of the famous polar cooperation of 1882-83, after having worked for years in favor of a German Antarctic Expedition, naturally wished, first of all, for a scientifically important and a geographically successful "German" expedition.

In Sir Clement's mind the "English" expedition had to solve all the problems and he simply condescended therefore to have the South Polar regions divided into two spheres of action: the British and the German. It was by pure courtesy that other expeditions, the Bruce, the Charcot and the Nordenskjöld, had been admitted to cooperate. Such a state of mind could evidently lead only to some misunderstandings, of which whoever is accustomed to read between the lines will find a few words of explanation on p. 13 of the report of Meinardus and Mecking.

In fact, it is only now that one can show, with the aid of the daily maps published by the Royal Society and the monthly maps published by Mecking, how much more could easily have been gained if extensive international cooperation, similar to the Arctic cooperation of 1882-83, had been attempted.

In preparing maps of atmospheric pressure for Oct., 1900, to March, 1904, Mecking introduced principally observations made on board ships. He disposed of approximately 600,000 individual observations. Then, of course, the observations made in Argentina, Chile, Cape Colony, Australia and New Zealand as well as the simultaneous observations of the German Antarctic Expedition were utilized. He divided the observations made at sea into quadrangles and deduced the monthly means. In most cases his isobars do not go farther than 50°S., except south of Cape Horn where the necessary connection with the data of the Antarctic stations could easily be obtained. The immediate result of this closer connection was the discovery of two important centers of action of atmospheric circulation, situated one over Belgica Sea, the other over Weddell Sea. From the discussion it is evident that these centers of action play as important a rôle in Antarctic and South American meteorology as the Icelandic and Northern Pacific centers of action upon the weather conditions of North America and Western Europe.

Mecking's discussion is most suggestive and the principal conclusion to be drawn from his very minute and far-reaching study is certainly that we can not be satisfied with such imperfect polar cooperative work as that done during 1901-1904. Meinardus and Mecking, in this monumental meteorological work, have not restricted themselves to well-established facts, but have had the courage to advance into the field of working hypotheses, opening at the same time the way to new researches and to new discoveries.

HENRYK ARCTOWSKI.

THE WORLD AND PARTS OF IT

In der Tropenwelt. Von Dr. Carl Holtermann. v and 210 pp. Ills., index. W. Engelmann, Leipzig, 1912. Mk. 5.80. 9½ x 6½.

This book treats, very adequately for the general reader, the most representative features of tropical vegetation and the conditions under which the floras develop. In the section on the mangrove, for example, the influence of tropical sea water upon the development of this form of vegetation is sketched. The epiphytes, palms, desert plants, tropical alpine growths, tropical fruits, condiments, tea, coffee, rice, opium and hashish are most prominent among the plants discussed.

PHYSICAL GEOGRAPHY

Zur Geschichte und Theorie des Vulkanismus. Von Dr. Karl Schneider. 113 pp. J. G. Calve, Prag, 1908. 10 x 7.

A good reference work on the history of volcanism. In the first part the author characterizes the theories held by various scientists: Varenius, Kircher, v. Buch, v. Humboldt, Poulett-Scrope, Lyell, Naumann, Suess, Branco, Geikie, Stübel, and others; in the second he develops his own opinions on the subject. Taking the interior of the earth as a solid but plastic mass, which a lessening of pressure may change into a liquid or gaseous condition, every disturbance of the equilibrium subsequent to variations of the density of the crust or of the intensity of gravity in the latter must produce a readjustment of the masses which allows the magma to penetrate to the surface. Hence volcanism always appears in connection with tectonic changes, but neither as the cause nor the effect of them, and is most frequent between the tropics because there the centrifugal tendency of the magma is strengthened by that of the equatorial parts of the globe.

Three phases can be distinguished in the character of the eruptions of any volcanic region, which, while sometimes overlapping, regularly succeed one another: the ejection of lava, of ashes (tufa) and of gas. Illustrating these phases by means of examples from Iceland, Italy and the central plateau of France, the author shows that in our present geological period the second phase predominates, with a few relapses into the first (Iceland, Hawaii) and some anticipations of the third (Mt. Pelé). These changes of volcanic intensity are due to the nutation of the earth's axis which disturbs the equilibrium of the masses both in the interior and the crust.

M. K. GENTHE.

ECONOMIC AND COMMERCIAL GEOGRAPHY

The Trade of the World. By James D. Whelpley. 436 pp. Ills., index. The Century Co., New York, 1913. $2. 8½ x 6.

This small volume discusses in convincing style the factors which have been successful in the world's trade and emphasizes the idea that the success which comes to any nation in its struggle for a part of the world's markets rests on something more than a surplus of commodities. Common sense, an appreciation of the people who barter and courage are some of the talents which lead to successful commerce.

An intimate exposition of the position and policy of the leading commercial nations, Great Britain, Germany, France, and others, fill most of the book and a short chapter on the foreign trade of the United States concludes it. While to the States are allotted only thirty-five pages, still the entire book, in a sense, relates to the trade policy of the home land, as constant comparison of the various nations and the United States runs through the volume. There is no better way to give our merchants a fuller appreciation of the necessities of the situation than to show how anxiously foreign sellers study the desires and even whims of their buyers. In some ways we excel the merchants of other lands; in others we are indifferent, and in still others a stable or acceptable policy is altogether wanting. A broad view of the diplomatic service of the United States, which urges that a consul should be thoroughly familiar with the needs of the country to which he is sent in order that he may report upon not only the field but also the peculiar demands of customers, seems to the author a most valuable adjunct to our trade policy.

ROBERT M. BROWN.

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later

NORTH AMERICA

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THE LIVING AND FOSSIL FLORA OF WEST VIRGINIA. Part 1: The Living Flora. By C. F. Millspaugh. Part 2: The Fossil Flora. By D. White. xiii and 491 pp. West Virginia Geol. Surv., Vol. V (A). Morgantown, W. Va. $1.50. 9 x 6½.

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NEW MAPS

Edited by the Assistant Editor

For system of listing maps see p. 74 of this volume

Maps issued by United States Government Bureaus

U. S. Coast and Geodetic Survey*

Canal Zone-Panama. Approaches to Panama Canal, Pacific Coast. 1:80,000. 9°1′ - 8°31′ N.; 79°47′ - 79°25′ W. 1 color. Chart No. 953. Nov. 1913. Price 30 cts.

New Jersey. Little Egg Inlet to Hereford Inlet. 1:80,000. 39°31′ - 38°57′ N.; 74°52′ - 73°56′ W. 1 color. With inset: Absecon Inlet. 1:40,000. 39°20′ and 74°25′ W. 1 color. Chart No. 1217. Nov. 1913. 50 cts.

[Covers part of the territory shown on Charts Nos. 122 and 123 on the same scale.]

Philippine Islands. (a) Philippine Islands: Southeastern Part. [Mean scale, 1:800,000]. 10°45′ - 5°10′ N.; 121°10′ - 127°5′ E. 2 colors. Chart No. 4708. Nov. 1913. 50 cts.

(b) Harbors on Burias and Ticao Islands and Ragay Gulf. [Seven maps, all 1 color:] (1) Port Busainga, Northeast Coast of Burias. From Spanish survey in 1841. 1:15,000. 13°8′ N. and 123°3′ E. (2) San Jacinto, East Coast of Ticao. From Italian survey in 1884. 1:20,000. 12°34′ N. and 123°44′ E. (3) Port Boca Engaño, East Coast of Burias. From Spanish survey in 1893. 1:10,000. 12°47′ N. and 123°19′ E. (4) Port San Miguel, Northwest Coast of Ticao. From a Spanish survey in 1892. 1:30,000. 12°40′ N. and 123°35′ E. (5) Port Pusgo, Ragay Gulf, Luzon. Surveyed in 1912. 1:30,000. 13°34.3′ - 13°28.5′ N.; 122°32.5′ - 122°39.2′ E. (6) Pasacao Anchorage, Ragay Gulf, Luzon. Surveyed in 1912. 1:20,000. 13°30′ N. and 123°3′ E. (7) Port Busin, North Coast of Burias. Surveyed in 1912. 1:20,000.

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* Only new charts are listed, not new editions of old charts.

13°10.0′ - 13°7.0′ N.; 122°55.7′ - 122°59.4′ E. Chart No. 4454. Jan. 1914. 30 cts.

[Chart No. 4708 is a general map including the whole of Mindanao.]

Rhode Island. Point Judith Harbor of Refuge. 1:10,000. 41°22.8′ - 41°20.4′ N.; 71°31.5′ - 71°28.2′ W. 1 color. Chart No. 275. Dec. 1913. 30 cts.

NORTH AMERICA

United States

United States. United States. 1:25,000,000. [Two maps:] (1) Mean Annual Precipitation. From map prepared by Henry Gannett, mainly from data of U. S. Weather Bureau, and published in U. S. G. S. Water Supply Paper 234, 1909. 7 colors. (2) Vegetation. Simplified from the Oxford Wall Map (compiled by Dr. M. Hardy and published 1909). 11 colors. Accompany "Impressions of the Vegetation of the United States of America (The American Transcontinental Excursion of 1912: III)" by A. G. Ogilvie, *Geogr. Journ.*, Vol. 42, 1913, No. 4, pp. 342-360.

[On map (1) seven rainfall grades are shown. On map (2) the following eleven vegetational formations are distinguished: (1) desert, (2) sage brush, (3) scrub (chaparral), (4) steppe, (5) park steppe, (6) taïga, (7) western coniferous forest, (8) mixed temperate forest, (9) warm temperate forest, (10) Gulf and Atlantic coastal forest, (11) hot wet forest. On both maps the route of this Society's Transcontinental Excursion is shown.]

Wyoming, etc. Yellowstone National Park showing Relief, Main Rivers and Lakes (From the U. S. G. S. Topographic Map). 1:750,000. [45°2′ - 44°9′ N.; 118°8′ - 110°0′]. Accompanies, on p. 339, "The United States National Parks (The American Transcontinental Excursion of 1912: II)" by H. O. Beckit, *Geogr. Journ.*, Vol. 42, 1913, No. 4, pp. 333-342.

[Helpful mainly in bringing out the relief by hypsometric tints.]

ASIA

China. Sketch Map Showing the route followed by F. Kingdon Ward, B.A., across the Chung-Tien Plateau, Yünnan, 1913. 1:1,250,000. 28°35′ - 26°40′ N.; 48°49′ - 100°20′ E. With inset of southeastern Asia, 1:70,000,000, showing location of main map. Accompanies, on p. 463, "Across the Chung-Tien Plateau" by F. Kingdon Ward, *Geogr. Journ.*, Vol. 42, 1913, No. 5, pp. 461-466.

[Route lay obliquely across the region between the upper constricted courses of the Yang-tze-kiang and Mekong Rivers at an altitude of 10,000 to 11,000 ft.]

Persia. Sketch Map to illustrate the journey of H. L. Rabino from Resht to Sari, 1908 and 1909. 1:1,750,000. 37°45′ - 36°0′ N.; 49°30′ - 53°12′ E. Accompanies, on p. 439, "A Journey in Mazanderan (from Resht to Sari)" by H. L. Rabino, *Geogr. Journ.*, Vol. 42, 1913, No. 5, pp. 435-454.

[Note on the map says that it is based on J. de Morgan's "Carte des Rives Méridionales de la Mer Caspienne."]

AUSTRALASIA AND OCEANIA

Kaiser Wilhelms Land. Die erste Ersteigung der Hochgebirgsgipfel im Hinterlande von Finschhafen (Deutsch-Neuguinea). Nach Aufnahmen von Missionar Chr. Keysser konstruiert von C. Schmidt. 1:300,000. 6°10′ - 6°40′ S.; 146°52′ - 147°50′ E. 2 colors. Accompanies, as Taf. 32, "Die erste Ersteigung der östlichen Gipfel des Finisterregebirges (Kaiser-Wilhelms-Land)" by C. Keysser, *Petermanns Mitt.*, Vol. 59, II, 1913, Oct., pp. 177-181.

EUROPE

Russia. Commercial and Industrial Map of European Russia. Based on statistical data for 1900 with regard to the commercial and industrial move-

ment and on many other geographical and economic-statistical sources. Compiled by B. P. Semenov-Tian Shanski. 1:1,680,000. 71° - 38° N.; 16° - 68° E. 98 colors. With 10 insets showing certain regions in greater detail, 16 insets showing the value of the trades and industries of Russia and 2 insets showing its division into commercial and industrial regions, as follows: I (all on the scale of 1:420,000, except 9 and 10, and in various colors): (1) [St. Petersburg and vicinity.] (2) [Polish-Silesian-Galician coal region.] (3) [Lodz and vicinity.] (4) [Konskie, Poland, and vicinity.] (5) [Warsaw and vicinity.] (6) [Kutno, Poland, and vicinity.] (7) [Ostrovietz, Poland, and vicinity.] (8) [Region to the west of Warsaw.] (9) [Donez coal and iron region.] [1:630,000]. (10) [Moscow industrial region.] [1:630,000.] II: [Sixteen inset maps of Russia, 1:23,000,000, in various colors, with the general title:] Intensity of Separate Trade and Industrial Types: Annual Movement in Roubles per Capita [divided into two categories, (a) the trade in, and (b) the manufacture of the articles mentioned, viz.:] (a) (1) general intensity of trade, (2) agricultural vegetational products, (3) products of stock-raising, of fisheries and hunting, (4) forest materials and lumber products, (5) mineral products and metal manufactures, (6) manufactures and fancy goods, (7) wine and spirits, (8) miscellaneous; (b) (1) general intensity of manufacturing, (2) food products, (3) animal products not used for food, (4) lumber and wood products, (5) useful minerals and products thereof, (6) textile products, (7) chemical products, (8) various mechanical trades, handicrafts and workmen's associations. III. (1) General Outline of Commercial and Industrial Regions. [1:2,300,000]. 13 colors. (2) General Outline of the Groups and Sub-Groups of the Regions. [1:11,000,000]. — In 9 sheets. Supplement to the work "Commerce and Industry of European Russia in 1900 by Regions," 13 vols., Ministry of Commerce and Industry, St. Petersburg, 1903-1911. [In Russian.]

[A highly important map which represents with great minuteness the economic regions of European Russia. The country is divided into no less than 1,065 economic units, based on the nature and value of their trade and manufactures. These 1,065 units are grouped together into 75 economic provinces (shown on inset III_2), these again into 12 major economic regions (inset III_1). These 12 regions are: (1) Northern Forest Region, (2) Northwestern Agricultural Region, (3) Moscow Industrial Region, (4) Central Cereal Region, (5) Ural Region, (6) Southeastern Stock Raising and Fishery Region, (7) Cis-Caucasian Region, (8) Southern Cereal Region, (9) Southern Mining Region, (10) Southwestern Agricultural and Industrial Region, (11) Polesie Region, (12) Vistula Region (*i. e.* Poland). Each of the 1,065 units is shown in a distinct color which expresses both the type and the value of its economic activities. Six types each are established for trade and manufacturing: these correspond respectively to the titles of the inset maps listed above under II and numbered (a) 2-7 and (b) 2-7. Each type is further subdivided into seven grades according to the value of the products in roubles per capita. All of these differentiations—a total of 84—are brought out clearly by the color scheme, each type being represented by a suggestive color group (as green for forest products) which is composed of tints of varying strength to express the value grades. Identification is facilitated by assigning a letter to each tint. In addition, towns are similarly differentiated, by means of 8 kinds of circles, according to the value of their output, and the nature of their products is shown by the corresponding coloring of the sectors into which these circles are proportionately divided. The nature and value, in 1900, of the economic activities of any district or town of Russia may thus be seen at a glance. For instance, the region about Archangelsk on the White Sea is seen mainly to have produced lumber to the value of 100-500 roubles per inhabitant, while the town itself had a trade valued at 5,000,000-10,000,000 roubles, divided into four equal parts, *viz.*, in lumber, agricultural products, fisheries and alcoholic beverages. The map is a veritable mine of information and is an admirable example of the synoptical value of the graphical (*i. e.*, in geographical terms, cartographical) method of presentation, for it contains the greater part of the material laid down in the 13 volumes which it accompanies. Its editorship is a guarantee of geographical treatment throughout: this is very evident in the establishment of

the economic regions themselves, which are not based on administrative units but on the natural limits of the economic activities which they represent (cf. *Diario N. 3: X Congresso Geografico Internazionale*, Rome [session of March 28, 1913], p. 4, and Vol. 13 (General Part) of the work cited above, which is accompanied by a map, 1:6,300,000, showing the subdivision into economic districts down to each of the 1,065 units, on which the units are, however, not very accurately reduced from the original map.)]

Russia. Handel und Industrie im Europäischen Russland. Von Benjamin v. Semenow-Tian-Schanskÿ. Nach der Originalkarte 1:1,680,000 reduziert. 1:7,500,000. 74° - 40° N.; 5° - 75° E. 32 colors. Accompanies, as Taf. 36, "Handel und Industrie im Europäischen Russland" by A. Woeikow, *Petermanns Mitt.*, Vol. 59, II, 1913, Oct., pp. 194-195.

[A reduction of the important map listed immediately above. The 84 differentiations in type and value of trade on the original map have been reduced to 27, however (3 value grades for each of the 9 types shown), and the number of economic units shown is conditioned by this reduction in the range of expression and is therefore considerably simplified. The names of the 12 regions and the 75 provinces into which they fall are given at the bottom of the map. The color scheme of the original has, in general, been followed. Some slips are noticeable in the color printing: thus the economic units north of Wyasniki (to use the German transliteration) in region 21 and east of Sergatsch in region 30 are shown in green stippling, for which there is no equivalent in the color key, while various units are practically left without color, probably through the defaulting of certain plates, as the units east of Suwalki (region 15), north of Brest Litowsk (region 73), south of Kaluga (region 28), and south of Tschistopol (region 37); while the lakes in the westernmost division of region 2 are colored instead of being left white. These may seem minute criticisms, and they would be so did one not have reason to expect high standards in color printing from the firm of Justus Perthes. These are minor considerations, however, as compared with the debt the western geographical world owes to the editor of *Petermanns Mitteilungen* for making more readily accessible to it this *magnum opus* in the domain of Russian economic geography.]

POLAR

Greenland. Sketch showing Approximate Routes of Recent Travellers across Greenland, 1912-13. 1:15,000,000. 85° - 59° N.; 90° W. - 10° E. Accompanies, on p. 547, "Recent Crossings of Greenland," *Geogr. Journ.*, Vol. 42, 1913, No. 6, pp. 545-550.

[Shows routes of Rasmussen, 1912, Koch, 1913, De Quervain, 1912: also of Peary, 1892 and 1893-95, and Nansen, 1888.]

WORLD AND LARGER PARTS

Southern Pacific and Indian Oceans. Preliminary Chart showing the Deep Sea Soundings taken on board the "Aurora" during the 1st and 2nd years' work of the Australasian Antarctic Expedition under Dr. Douglas Mawson, 1912-13. 1:15,000,000. 35° - 75° S.; 80° - 180° E. 1 color. Accompanies "The Soundings of the Antarctic Ship 'Aurora' between Tasmania and the Antarctic Continent (1912)" by J. K. Davis and "Notes on the Antarctic Soundings of the 'Aurora'" by J. Murray, *Geogr. Journ.*, Vol. 42, 1913, No. 4, pp. 361-364, together.

[Valuable expansion of the sketch map previously published in the *Geogr. Journ.* (see, under same heading, *Bull.*, Vol. 45, 1913, p. 799). The edge of the continental shelf, off Adélie Land, is shown to lie about 100 miles off the coast, while between here and Tasmania the soundings average 2,000 fathoms, except for the submarine elevation in 47° S. and 148° E. already shown on the earlier sketch map. The soundings between Adélie Land and Tasmania practically lie on what, since the elimination of the "Antarctic Ocean" due to the establishment of the Antarctic Continent, is now generally accepted, after

Krümmel, as the boundary between the Indian and Pacific Oceans (meridian of southern end of Tasmania: 147° E.) The map also shows the coastal portions of the Antarctic Continent recently discovered by the Australasian Antarctic Expedition, *viz.*, Queen Mary Land (95° E.) adjoining Kaiser Wilhelm II Land to the east, snow covered land 2,500 ft. high in 132° E., and King George V Land (148° E.) contiguous with Adélie Land on the east.]

World. Chart to illustrate a paper on the Magnetic Survey of the Oceans by Prof. L. A. Bauer. [Mercator's projection; equatorial scale 1:223,000,000.] Accompanies on p. 519, "The Magnetic Survey of the Oceans" by L. A. Bauer, *Geogr. Journ.*, Vol. 42, 1913, No. 6, pp. 517-530.

[Shows the track of the *Carnegie* and the stations on land where the magnetic elements have been determined by the Department of Terrestrial Magnetism of the Carnegie Institution.]

Other Maps Received

NORTH AMERICA

United States

Idaho. Judge's Map of Idaho. Compiled from latest Government Surveys and other original sources and engraved by W. Elliott Judge, 24 California St., San Francisco, 1912. $5.00.

New England. Map of the New England States, showing State, County and Town Boundaries, Post Offices, Railroad Stations, &c. 10 mi. to 1 in. Walker Lith. & Pub. Co., 400 Newburg St., Boston, Mass., 1909. 25 cts.

Utah. Judge's Map of Utah. Compiled from latest Government Surveys and other original sources and engraved by W. Elliott Judge, 24 California St., San Francisco, 1912. $5.00.

SOUTH AMERICA

Argentina. República Argentina: Region Oeste de Buenos Aires, que comprende los campos de Oeste de la Provincia de la Pampa. Catastro de las Propiedades Rurales, nombre de las Estancias y Colonias, Vias ferreas y Caminos principales. 1:300,000. Construido con datos propios por el Agrimensor Enrique Glade, Cangallo, 845, Buenos Aires, 1911.

Plano preliminar y parcial de los Territorios de Neuquen, Rio Negro, Chubut y Santa Cruz. Levantado por la Sección Topográfica del Museo y dibujado por la Sección Cartográfica del mismo, 1896. 1:600,000. Inset: Carta de Conjunto indicando la ubicación de la región detallada en el mapa parcial. 1:7,000,000. Museo de la Plata, [La Plata.]

AFRICA

Algeria. Nouveau plan d'Alger et de ses environs. 1:10,000. Librairie Garnier Frères, 6, Rue des Saints-Pères, Paris.

Plan d'Oran et ses environs. 1:8,000. Inset: Environs d'Oran, 1:800,000. Librairie Garnier Frères, 6, Rue des Saints-Pères, Paris.

Egypt. Postal Map of Lower Egypt. 1:250,000. Insets: Cairo, 1:75,000; Maritime Line, Suez to Tor, 1:2,000,000; Offices in Alexandria, 1:50,000. Survey Department, Cairo, 1906.

EUROPE

Austria. G. Freytags Touristen-Wanderkarte. Blatt IV, Hochschwab; Bl. VII, Wachau; Bl. VIII, Östl. Salzkammergut; Bl. IX, Westl. Salzkammergut; Bl. X, Berchtesgadenerland und Pinzgau; Bl. XI, Südl. Waldviertel mit dem Donautale; Bl. XII, Hohe Tauern; Bl. XIV, Julische Alpen und Karawanken. 1:100,000. Kartogr. Anstalt G. Freytag & Berndt. Wien. K. 4 each.

Austria-Hungary. Flemmings namentreue (idionomatographische) Länderkarten: Blatt 4, Karte von Österreich-Ungarn. 1:1,500,000. Insets of Budapest, Triest and Wien, 1:200,000; Austria-Hungary, 1:15,000,000. Herausgegeben von Prof. Dr. A. Bludau und Otto Herkt. Carl Flemming, Verlag, A. G., Berlin W. und Glogau. M. 3.50.

Balkan Peninsula. H. Kiepert's Generalkarte der Südost-Europäischen Halbinsel. 1:1,500,000. Insets: Der Hellespont oder die Dardanellen Strasse mit der Halbinsel von Gallipoli und der Troïschen Ebene, 1:300,000; Constantinopel und der Bosporus, 1:200,000. Lithogr. u. Druck v. Dietrich Reimer (Ernst Vohsen), Berlin, 1912.

France. Carte Campbell—''Environs de Paris'' avec Plans et Monuments, extrait de ''La France'' en 15 Régions. Dressée d'après les documents les plus récents à l'échelle de 1:320,000. With 29 insets of French cities. Ed. Blondel La Rougery, Éditeur, 7, Rue Saint-Lazare, Paris. 1 fr.

Environs de Cannes, Nice et Menton. 1:80,000. Insets [1:40,000]: Environs de Menton; Environs de Nice. Librairie Garnier Frères, 6, Rue des Saints-Pères, Paris.

Plan de Nice et ses environs. 1:9,260. Inset: Plan de Cannes et de ses environs à l'échelle de 1:28,570. Librairie Garnier Frères, Paris. 1 fr.

Plan de Menton et ses environs. 1:9,500. Insets: Menton à l'échelle de 1:4,700; [Mediterranean coast from Pte. de la Calle to Bordighera], 1:400,000. Librairie Garnier Frères, Paris. 1 fr.

Nouveau Plan de la Ville de Lyon et ses Faubourgs. 1:12,500. Librairie Garnier Frères, Paris.

Plan de Toulon et ses environs. 1:4,000. Inset: Environs de Toulon, 1:11,500. Librairie Garnier Frères, Paris.

Germany. G. Freytags Automobil- und Radfahrerkarten: Blatt 7, Münster. 1:300,000. Verlag u. Druck der Kartogr. Anstalt G. Freytag u. Berndt, Wien u. Leipzig. Mk. 1.70.

Geognostische Karte des Königreichs Bayern. Fünfte Abteilung: Die Bayerische Rheinpfalz. Drittes Blatt: Kusel. Mit einem Hefte Erläuterungen. Im dienstlichen Auftrage ausgearbeitet durch die Geognostische Abteilung des Königl. Bayerischen Oberbergamtes unter der Leitung von Dr. Ludwig von Ammon. Verlag von Piloty & Loehle, München, 1909.

Greece. Karte von Griechenland zur Zeit des Pausanias bearbeitet von Universitätsprofessor H. Blümmer, Zürich. 1:500,000. Geographischer Karten-Verlag Bern u. Leipzig, Kümmerly & Frey u. A. Francke. [1911].

Italy. Carta economica industriale della Provincia di Mantova alla scala di 1:100,000. Inset: Città di Mantova, 1:10,000. Pubblicata per cura della Camera di Commercio di Mantova, 1909.

Carta amministrativa stradale della Provincia di Torino, 1:250,000. Istituto Geografico de Agostini, Novara. Lire 1.20.

The Netherlands. Postkaart van Nederland. 1:250,000. Ministry of Posts, The Hague.

Switzerland. H. Kümmerly: Gesamtkarte der Schweiz. 1:400,000. Geogr. artist. Anst. Kümmerly & Frey, Bern. Fr. 4.50.

Spezialkarte des Exkursionsgebietes von Bern. 1:75,000. Herausgegeben unter Mitwirkung des Verkehrs-Verein Bern. Bearbeitet von H. Kümmerly & Frey, Geogr. artist. Anstalt, Bern, 1908. Fr. 3.

Switzerland-Germany. Professor W. Liebenow's Rad- und Automobilkarte der Nordwestschweiz und von Südwestdeutschland. Verlag von Wepf, Schwabe & Co., Basel. Stich und Druck der geograph. Anstalt von Ludwig Ravenstein, Frankfurt a. M. Fr. 3.

WORLD AND LARGER PARTS

Egypt-Turkey in Asia. Égypte, Palestine-Syrie: Carte politique et historique. 1:2,200,000. Insets: Chemins de fer de l'Égypte; Environs du

Caire; Jérusalem, Hébron-Jéricho & La Mer Morte; Environs de Jérusalem; Environs d'Alexandrie. Librairie Garnier Frères, 6, Rue des Saints-Pères, Paris. 2 fr.

Russian Empire. (a) Map of Post Routes of the Russian Empire, 1913. (b) Telegraph Map of the Russian Empire, 1910. With insets: St. Petersburg; Transcaspia; Kamchatka. 35 versts to the inch. (c) Postal-Telegraph Map of the Russian Empire, 1912. 35 versts to the inch. With insets: Asiatic Russia, 200 versts to the inch; St. Petersburg, 10 versts to the inch. [In Russian.] Ministry of Posts and Telegraphs, St. Petersburg.

World. Rand, McNally & Co.'s New Travel Chart and Distance Table of the World. [Mercator's projection; equatorial scale, 1:85,000,000.] Rand, McNally & Co., New York, 1907.

ATLASES

Hammond's Descriptive Atlas of Panama and the Isthmian Canal. 16 pp. containing maps, ills. and descriptive text. C. S. Hammond & Co., New York, [1912]. 25 cents. 13½ x 10 inches.

Bible Atlas (Non-Sectarian): Physical-Historical. By Townsend MacCoun. 121 plates of maps and 125 pp. of text. L. L. Poates Publishing Co., New York, 1912. $1.50. 7 x 4½.

[The inclusion of numerous hypsometric maps (wax-engraved) in the physical section shows the right point of view: the "relief maps" (half-tone reproductions of wash drawings) are poor.]

Eisenbahn- und Verkehrs-Taschen-Atlas von Deutschland mit den anliegenden Grenzgebieten von Frankreich, Schweiz, Österreich, Russland, Belgien, Holland, Dänemark und Schweden. Nebst einem Stations- und Ortsverzeichnis von ca. 38,000 deutschen Orten. Massstab: 1:800,000. Verkleinerte Ausgabe aus Eisenbahn- und Verkehrs-Atlas von Europa (Abt. Deutschland) begründet von Dr. W. Koch und C. Opitz, herausgegeben von O. Opitz. Ausgabe 1912. xx, 260 pp., and 48 plates. J. J. Arnd, Leipzig. Mk. 4. 7 x 5.

[Exhaustive railroad atlas of Germany differentiating minutely between the various kinds of lines and of stations.]

Hammond's Modern Atlas of the World. A New Series of Physical, Political and Historical Maps Compiled from Government Surveys and Exhibiting the Latest Results of Geographical Research, Accompanied by a Gazetteer of the Principal Towns of the World. 128 pp. of maps, 48 pp. of text and 8 pp. supplement on the Panama Canal. C. S. Hammond & Co., New York, 1911. 13½ x 10½.

[Gaudy wax-engraved maps not always sustaining the claim of the pretentious sub-title.]

L. L. Poates & Co's. Complete Atlas of the World. Containing Maps of the United States, its 48 States, its Territories and its Insular possessions, together with all of the Canadian Provinces and every other country of the world. 193 pp. of maps and 32 pp. of text. L. L. Poates Publishing Co., New York [1912]. 9½ x 7.

[Wax-engraved maps of somewhat more pleasing appearance than usual: relief in brown hachuring, railroads in red.]

The Standard Atlas and Chronological History of the World. Containing New Maps of all the States and Territories of the United States and Every Country in the World, including the Latest Census of the United States, together with an Entirely New Gazetteer of the Cities of the World, and a Comprehensive Review of the Machinery of the Federal Government [and a Chronological Table of Universal History]. Arranged by Charles Leonard-Stuart. 327 pp. (90 pp. of maps and 235 pp. of text). Syndicate Publishing Co., New York, 1912. $1.50. 8½ x 7.

[Usual type of wax-engraved maps, somewhat clearer than ordinarily.]

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BROADWAY AT 156TH STREET

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EFFECTS OF CONTINENTAL GLACIATION ON AGRICULTURE*

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Some reference is made in recent geographical texts to the effects of the Pleistocene continental ice sheets on the industry, commerce and agriculture of those areas of North America and Europe which they invaded.[1] Such passages are in the main confined to broad generalizations. No detailed, comparative summation of the favorable and adverse effects of the former presence of the ice on the human occupation of the glaciated regions is attempted. Limitations of space in view of the breadth and involved nature of the subject are no doubt responsible for the failure of the authors to consider it more fully. Yet the wide areal distribution of phenomena due to glaciation, and the very complexity of relationships these have to modern civilization, invests them with great geographical interest.

In this paper it is attempted to present and analyze only one phase of this broad subject, namely a comparative study of the beneficial and harmful effects of the ice invasions on agriculture.

Agriculture is crop production. The comparative success of agriculture is measured by the amount, character and permanence of crop production. An enumeration and evaluation of the factors

* This paper was awarded the Walker Prize in Natural History, 1913, by the Boston Society of Natural History, Boston, Mass.

[1] Bowman, I.: Forest Physiography, N. Y., 1911, p. 486 and elsewhere.
Salisbury, R. D.: Physiography, N. Y., 1907, pp. 228-289, 316.
Salisbury, Barrows & Tower: Elements of Geography, N. Y., 1912, pp. 405-407, etc.
Dryer, C. R.: High School Geography, N. Y., 1912, pp. 122, 353.

due to glaciation which make for and against the *optimum* of each of these units, or their sum, will, therefore, express the relative benefit or harm done to agriculture by the invasion of a given region by glacial ice.

Topics Treated

Even with the limitation imposed on this paper a wide array of topics needs to be considered. If some of these topics seem to be inadequately treated this may be attributed in part to their number. In the list of topics and sub-topics, given below, relative importance has in some instances been subordinated to convenience and continuity of discussion.

1. General Relations:
   - (*a*) Geographical Position of the Glaciated Areas with reference to Modern Civilization.
   - (*b*) Comparison of the Agricultural Status of Glaciated Areas with that of Non-Glaciated Areas.
   - (*c*) Climatic and Topographic Position of Glacial Zones of Erosion and Deposition.
2. Effects due to Relief Changes caused by Glaciation:
   - (*a*) Increased Diversity of Relief and its Agricultural Consequences.
   - (*b*) Modification of Relief and its Agricultural Consequences.
   - (*c*) Effects of Relief Changes on Ground Water Conditions as Affecting Agriculture.
3. Glacial Soils:
   - (*a*) Characteristics Distinguishing Glacial Soils from other Soils, and their Agricultural Significance.
   - (*b*) Variation in Age of Glacial Soils with respect to Crop Productivity.
   - (*c*) Textural Variations of Glacial Soils in relation to Diversified Agriculture.
4. Effects on Agriculture due to Hydrographic Phenomena Resultant from Glaciation:
   - (*a*) Glacial Lakes and their Effects on Local Climates and Agriculture.
   - (*b*) Agricultural Relations of Deposits in Drained and Filled Glacial Lake Basins.
5. Summary.
6. Conclusion.

1. General Relations

(a) Geographical Position of the Glaciated Areas with reference to Modern Civilization. Pleistocene continental glaciation was a phenomenon centering essentially about the North Atlantic Basin. Around the North Atlantic Basin are centered, also, the leading nations of the modern world. In the generalized statements of the textbooks, it is sometimes suggested that the leadership of

such nations is largely accruing from natural advantages they have derived from continental glaciation. Without question many of the natural resources of these nations are owing to the invasion of the ice. Whether, however, what has been gained, on the whole, more than balances possible losses due to the ice advances cannot be so readily judged by cursory examination. Geographical factors other than glaciation, moreover, may be determinant in this general grouping of modern, virile peoples around the North Atlantic, and historical considerations may not be wholly set aside. Moreover, it must not be forgotten that France, Italy, New Zealand and Australia, to name examples without the glaciated regions, are also in the van of modern progress.

To put the general effect of glaciation on the comparative advancement of nations to a critical test would be most difficult, as may readily be conceived. Pertinent objections and exceptions could be made against any argument or figures cited to demonstrate either the positive or negative side of so broad a proposition: *i. e.*, that the advanced status of nations within the glaciated areas was or was not due to the effects of the ice invasions. Limitation of the question, however, to the general effect of glaciation on the agricultural status of a country or region makes available certain statistics which, if not conclusive for the broader areas, are nevertheless interesting and, applied to narrower areas, are quite significant.

(b) Comparison of the Agricultural Status of Glaciated Areas vith that of Non-Glaciated Areas. The percentage of cultivated and of the total area of France, practically unglaciated, may be ompared with a similar percentage of cultivated lands in Gernany, an adjacent country of which a large part of the total area vas glaciated. In 1900 Germany with a total acreage of 133,550,020 cres, had 86,596,830 acres of land under cultivation and in pasture, r nearly 65 per cent. of the whole. France with a total area of 30,799,000 acres had 59,329,593 of these in cultivation and pasture, r nearly 45 per cent. of the total number.[2] The two countries have early equal areas, but France has the more genial climate. Despite his climatic advantage of France the figures indicate that Gerany has 20 per cent. more of productive land. Also Germany pports nearly a third more population than does France, a fact hich is in keeping with the amount of difference in productive nd. The excess value of Germany's imports of agricultural proucts (principally food stuffs) over exports, expressed by a number

[2] *The Statesman's Year Book*, 1911, London. Articles on France and Germany.

is 676; while for France it is 929.[3] Here again Germany clearly has the advantage though she supports a greater population.

While these statistics demonstrate rather conclusively the agricultural superiority of Germany it does not follow that the evident difference in crop productivity of the two countries is due to glaciation. Such a deduction depends on the fundamental assumption that all other factors influencing crop production in the two countries are the same, and this assumption can be only an approximation. For example, the relative fertility of different French soils is in a very large measure dependent on the character of the underlying geological formation from which each has been derived. Whether Germany would have had an equal, greater, or less amount of fertile soil than France, of residual and alluvial derivation, is impossible of determination. Again the proportionate area of highland and lowland in the two countries would need to be considered. Nor does it suffice to offset the agricultural benefit France derives from her more genial climate by the fact that some of the fertile areas of Germany do not owe their fertility to glaciation.

Very recent statistics for the United States make possible a somewhat more accurate comparison, than the foregoing, of the agricultural status of glaciated areas with non-glaciated areas, inasmuch as the figures are more detailed, and as such differences as appear may be ascribed to glaciation with considerable assurance. In the following table appear agricultural statistics for states in the humid agricultural region of the country. On the left are grouped states whose territory lies wholly within the glaciated area; on the right those without the zone of glacial influence.

GLACIATED STATES OF THE EASTERN HUMID REGION OF THE UNITED STATES[4]

NAMES	TOTAL AREA IN 1000'S OF ACRES	AREA IN FARMS IN 1000'S OF ACRES	TOTAL VALUE OF FARM LANDS IN 1000'S OF DOLLARS
Minnesota	51,749	27,675	1,019,102
Wisconsin	35,364	21,060	911,938
Michigan	36,787	18,940	615,258
New York	30,498	22,030	707,747
Vermont	5,839	4,663	58,385
New Hampshire	5,779	3,249	44,519
Maine	19,133	6,297	86,481
Massachusetts	5,145	2,876	105,532
Rhode Island	683	443	15,010
Connecticut	3,085	2,185	72,206
Illinois	35,867	32,522	3,090,411
Iowa	35,575	33,930	2,801,974
	265,504	175,870	9,528,563

Percentage of total area in farms 66 per cent.
Average value per acre of farm land $54.00

[3] Chisholm, G. G.: Handbook of Commercial Geography, Eighth Edition, London, 1911, pp. 566–568.

[4] *Agriculture Bulletins*, 13th Census of the U. S., 1910, Bureau of Census, Dept. of Commerce and Labor.

NON-GLACIATED STATES OF THE EASTERN HUMID REGION OF THE UNITED STATES

NAMES	TOTAL AREA IN 1000'S OF ACRES	AREA IN FARMS IN 1000'S OF ACRES	TOTAL VALUE OF FARM LANDS IN 1000'S OF DOLLARS
Delaware	1,258	1,039	34,938
Maryland	6,362	5,057	163,452
Virginia	25,768	19,496	394,659
North Carolina	31,194	22,439	343,165
South Carolina	19,517	13,512	268,775
Georgia	37,584	26,953	370,353
Florida	35,111	5,253	93,738
Alabama	32,818	20,732	216,944
Tennessee	26,680	20,042	371,416
Kentucky	25,716	22,189	484,465
West Virginia	15,374	10,026	207,076
Oklahoma	44,425	28,859	649,066
Arkansas	33,616	17,416	246,021
Mississippi	29,672	18,558	254,022
Louisiana	29,061	10,439	187,803
	394,156	242,010	4,285,893

Percentage of total area in farms 61.4 per cent.
Average value per acre of farm land $18.00 nearly.

While this tabulation shows a nearly equal percentage of total area in farm lands (therefore further justifying the comparison of the regions) it also exhibits a remarkable disparity in average farm land values between the glaciated and non-glaciated areas, the value of the former being three times as great. As glaciation is the most important physiographic factor of difference between the two regions, the difference in values may well be ascribed to its effects. Yet the comparison, like the preceding one, is between extensive regions remote enough from each other to permit of a wide variety of factors being operative in bringing about differences in their agricultural status. Thus their climatic, topographic and geologic structure conditions can not well be correlated. A comparison of smaller glaciated and unglaciated areas, immediately adjacent to each other, will serve, therefore, as a check on the integrity of the deduction that the differences so far found are due to glaciation.

Some 9,000 square miles of territory in southwestern Wisconsin constitute the larger part of the Driftless Area, a region unique in that it was entirely encompassed by the ice advances, but itself shows no traces of ever having been covered by them. The elevation, geological structure and climate of this Driftless Area are in no important respect dissimilar from those of the immediately adjacent glaciated areas. Writing about the contrasts between the glaciated and driftless portions of Wisconsin, Whitbeck[5] says: "In the driftless area only 43 per cent. of the land is improved,

[5] Whitbeck, R. H.: The Glaciated and Driftless Portions of Wisconsin. *Bull. of the Geogr. Soc. of Phila.*, Vol. IX, No. 3, July, 1911, pp. 19–20.

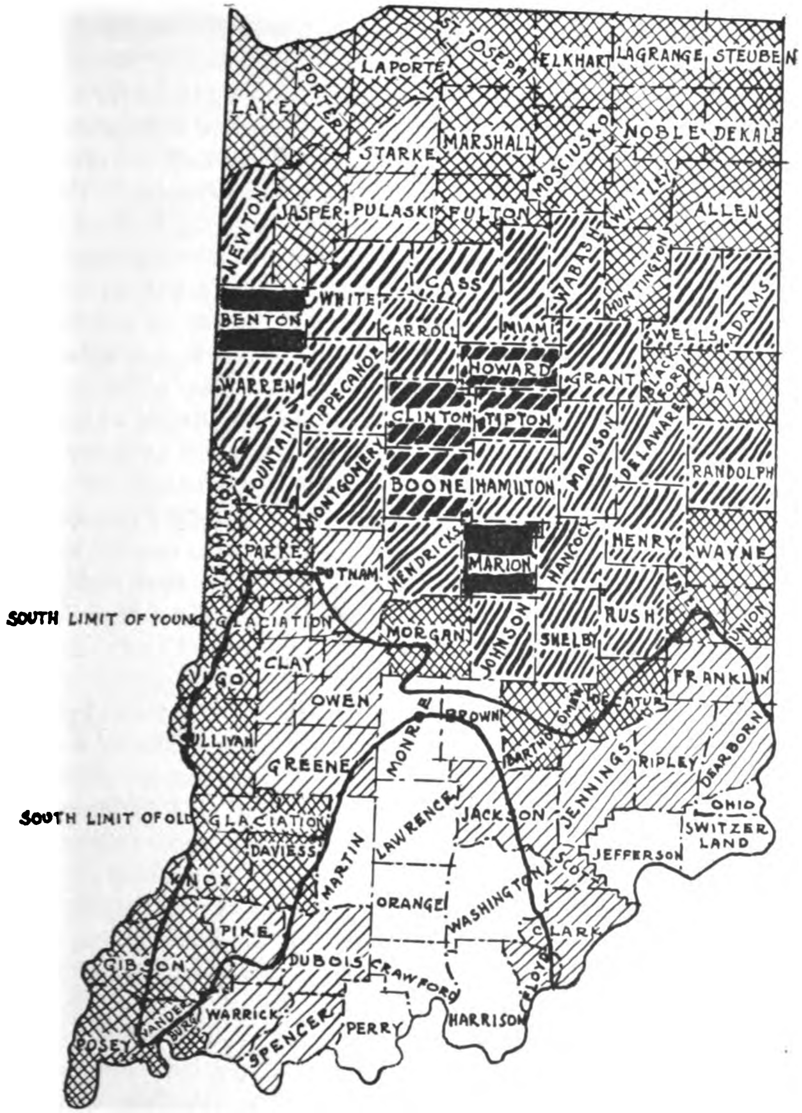
while in the drift covered area 61 per cent. is improved, a difference of 18 per cent." Further: "The value of farms and farm buildings averages nearly 50 per cent. greater per square mile in the drift-covered counties than in the driftless." He summarizes other comparisons he has made, bearing on the relative agricultural status of the contrasted areas as "all clearly in favor of the glaciated region."

Like results are obtained on comparing statistics of adjacent counties in Indiana within and without the glaciated area. Thus the average value of farm lands in Daviess Co., within the glacial area, is \$50-\$75 per acre; while in Martin Co., next east, outside the glaciated area, the average value is \$10-\$25 per acre. Similarly Greene Co., glaciated, shows average values of \$25-\$50 per acre, while Lawrence Co., adjacent, unglaciated, shows \$10-\$25 per acre. Daviess Co. has 90-95 per cent. of its total area in farms, Martin 80-90 per cent.; Greene Co. 90-95 per cent., Lawrence 80-90 per cent.[6] That these relations hold generally, as well as for selected typical counties, is shown especially clearly by a map of Indiana (Fig. 1) on which have been set down the average farm values, per acre, by counties and the extent of the several ice invasions outlined.

While it is quite apparent from these comparisons that, as regards agriculture, the status of the glaciated lands is superior to that of the unglaciated areas, it must not be assumed, as is commonly done, that this is wholly due to differences in soil fertility, nor that only benefits were conferred by glaciation. Moreover, the comparisons so far made have been between non-glaciated regions and regions of glacial deposition, *i. e.*, places where the accumulation of drift was in excess of the erosive effects of the ice. It is, therefore, necessary, before finally adjudging the benefits to agriculture of glaciation to outweigh any damage done by the ice occupation, to consider also, whether, in regions where glacial erosion predominated, the possible injuries done by it may not more than counterbalance the benefits conferred on the areas of drift accumulation.

(c) Climatic and Topographic Position of Glacial Zones of Erosion and Deposition. While a few glacialists still question the ability of glacial ice to erode notably deep rock basins, or to reduce considerably the height of summit areas, all students of the subject

[6] Data from: *Agriculture Bulletin.* Indiana, 13th Census of the U. S., 1910, map. p. 2; Leverett, F.: The Illinois Glacial Lobe, *U. S. Geol. Surv. Monogr. XXXVIII*, 1899, Plate VI.



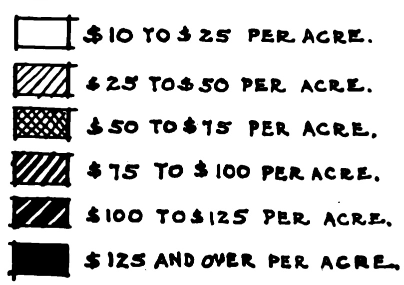


FIG. 1—Map of Indiana Showing Relative Value of Farm Lands by Counties in Old and Young Glaciated and Non-Glaciated Area, after 1910 Census of the U. S. and Leverett.

are unanimous in conceding the effectiveness of the continental ice sheets in scouring off the cover of residual material and rotted rock which had, in all probability, accumulated in preglacial times over the areas central to the ice dispersion. The result of such ice-scour, in its extreme condition as it occurs in Norway and the northern part of the Scottish Highlands, is typically described by Geikie[7] in a single sentence as follows: "Seen from a height, the ground appears like a billowy sea of cold grey stone." Similar conditions in North America occur in the Laurentian Plateau of Canada of which Bell says[8]: "The Archean country is thoroughly denuded of everything down to the bed rock." Since agriculture is primarily dependent on the existence of a soil cover, and since sufficient time has not elapsed to permit of the renewal, by weathering, of a residual mantle in the postglacial period, there can be no doubt that the agricultural availability of the regions of glacial erosion was seriously impaired by the ice-scour. Moreover, the regions of glacial erosion approach those of drift accumulation in areal extent. If, therefore, only the relative areas of the contrasted regions be considered, the damage done by the removal of the soil cover in the one, might well equal the beneficial effects conferred on the regions where deposition predominated.

It is, therefore, fortunate for mankind, that the regions of glacial erosion are all such as would in any event (except that of a much warmer preglacial climate persisting into the present, if continental glaciation had not occurred) have been unavailable for crop production of a high order. Because of climatic or topographic conditions, or both, the regions of glacial erosion are, in general, unsuited for cultivation. Inasmuch as such factors are independent of glaciation the damage done by the ice in removing the soil cover, in so far as the areas themselves are concerned, is not to be counted either as an agricultural gain or loss.

The general centers of ice accumulation and dispersion (practically coincident with the regions of glacial erosion) are for the greater part situated in comparatively high latitudes. Thus in North America, the Labradorean, Keewatin and Cordilleran centers are all situated in the Boreal or Arctic climatic provinces as characterized by Russell.[9] A leading climatic feature of the Boreal province is its low mean annual temperature—in general from 32°-40° F. Because of this, and especially also because of the shortness of the

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[7] Geikie, A.: Text Book of Geology, Fourth Ed., 1903, Vol. 2, p. 1309.
[8] Bell, R.: On Glacial Phenomena in Canada. *Bull. Geol. Soc. Amer.*, Vol. 1, 1890, p. 295.
[9] Russell, I. C.: North America, New York, 1904, pp. 201-202 and Plate III.

growing season, agriculture is of small importance. In the Arctic province the conditions are even more severe. It is interesting to note, further, that the Labradorean center is a plateau with elevations ranging between 500 and 2,000 feet above the sea, and that on the lowlands of the St. Lawrence Valley immediately beyond its southern edge, where climatic conditions favor a higher development of agricülture, is also found the beginning of the regions of drift accumulation. Similarly the Cordilleran center comprises high, steep, mountain areas, topographically unsuited for agriculture; while in the central plains of the continent, where hot continental summers favor agricultural development at higher latitudes than in the upland regions to the west and east, occur also the depositional zones of the marginal areas of the glacial ice moving out from the mountains and from the Keewatin center.

In Europe the glacial centers of ice dispersion of northern Scandinavia, Finland and Lapland occupy even higher latitudes, and though on the Norwegian coast normal climatic conditions due to high latitude are somewhat offset by the modifying influence of the Gulf Stream Drift and its accompanying warm, on-shore winds, the climatic conditions are nevertheless as severe as in the Boreal province of North America. Moreover, the Scandinavian Peninsula on the whole forms a plateau with elevations over 4,000 feet, rising highest on the west coast where otherwise the climatic conditions would be most favorable. Finland and Lapland are notably inhospitable climatic regions lying beyond the general northern limit of agricultural land.

The Scottish Highlands, second in importance, in Europe, as a center of ice dispersion and a region of predominant glacial erosion, lie much farther to the south than the Scandinavian area, but their agricultural importance, excepting the glacial factor, is minimized by the fact that they also are upland areas with average elevations of 1,500 feet above sea level. While the mean annual temperatures of this region are only slightly lower than those of agricultural England, the elevations are sufficiently great to promote a very high rainfall, the annual precipitation being eighty inches and over. This amount is excessive for agriculture, especially since it is distributed rather uniformly throughout the year. Such a climate may be characterized as "raw." The same description applies in the main to the lesser centers of ice erosion in the British Isles; the Southern Uplands of Scotland, the English Lake District, North Wales and the Irish mountains. All of these are highland areas and have a rainfall of sixty inches or over.

In Europe, as in North America, the lowlands immediately adjacent to the highland areas of ice erosion are notably seats of glacial deposition. Here again, also, climatic conditions favor agricultural development. Thus favorable conditions of climate and thick deposits of drift are coincident. In the Lowlands of Scotland for example, "Wide areas of the central counties are covered with it [till] continuously to a depth varying from two or three feet up to one hundred feet and more. But as we follow it towards the mountain regions it becomes thinner and more interrupted."[10] Similarly the agricultural district of southern Norway and Sweden is made up of morainic and outwash deposits,[11] as are also, in large part, the central agricultural plains of Ireland. It may be questioned, indeed, whether the preglacial residual materials of the latter two regions would not have lent themselves better to agricultural pursuits than the boggy conditions and refractory morainic accumulations introduced in these areas by glaciation. However, the general agricultural utility of these lands is largely influenced by climate, and they do not constitute large enough areas in any event to affect, appreciably, previously stated conclusions in regard to the generally favorable effects on agriculture by reason of glacial deposition.

Several minor areas of ice dispersion and erosion in North America still remain to be considered. These are the New England Highlands, the Adirondacks and local areas in the western mountains. While these are all upland areas, in general unsuited, topographically, for agriculture, it is worth noting that in them also the general rule holds that glaciation denuded the slopes and summits, leaving them with only a thin veneer of till in place of their former residual cover, but resulted in a thick deposit of drift in the valley bottoms and lower areas. This relation is discussed in more detail in later paragraphs. Here it need only be stated that the average result was to make the unfavorable agricultural sites more unfavorable, but to improve the favorable ones, probably on the whole a net gain in desirable agricultural lands.

Finally it should be noted that almost the total areas of the regions of glacial erosion are, or were originally, forest lands; and to a forest crop they are climatically and topographically best adapted. Certainly, therefore, glaciation must have left a sufficient nucleus of soil over these areas to make possible the forest growth,

10 Geikie, James: The Great Ice Age. London, 1894, p. 15.
11 Geikie, A.: Text Book of Geology, Fourth Ed., London, 1903, Vol. 2, p. 1332.

if indeed it is not possible, as has been stated, that a forest can grow in soil formed of its own humus.

Summarizing, then, the general relations of agriculture and glaciation, as considered under the three heads above, it is clearly apparent that the total effect of glaciation has been beneficial to agriculture. On the other hand some of the effects of glaciation were detrimental. That the beneficial effects are not wholly due to soil fertility has also been suggested. In this discussion and analysis a consideration of the effects of the various factors due to glaciation, especially as operative in the regions of drift accumulation, is, therefore, next in order.

2. Effects due to Relief Changes caused by Glaciation

(a) Increased Diversity of Relief and its Agricultural Consequences. Increased diversity of relief due to glaciation may be the result of either ice erosion or depositional accumulations. The effect of ice erosion in accentuating topography is manifested most conspicuously in regions of great diversity of rock structure within narrow areal limits; in places where larger areas and bands of relatively resistant rocks are in immediate juxtaposition with rocks of little resistance to ice erosion; and where the ice sheets invaded regions of rather bold preglacial relief. Morainic ridges and drumlins are the most important forms (from the standpoint of this discussion) of depositional nature which heighten the relief; of minor bearing, because of less frequent occurrence and areal extent, are kames and eskers.

The exposure of a great variety of rocks within small areas is characteristic only of regions of disordered geological structure, namely mountains and districts of worn-down mountains. Within the glaciated areas such regions are found principally in the sections where glacial erosion was predominant, sections which, as has been indicated, are also of little agricultural importance. Thus such great variety of rock structures is found on the Laurentian Highlands of North America, and much of the relief that these have at the present time is due to differential glacial erosion of their diversified bed rock.[12] The same thing is true of the Scottish Highlands where rock basins are extremely plentiful. It is quite certain, also, that some of the inequalities of relief, giving rise particularly to the lake basins, that occur in New England, the Adirondacks, the Lake Superior Highlands and the Lake Region of Finland, are

12 Bowman, I.: Forest Physiography, New York, 1911, pp. 565–566.

of this origin. In the Adirondacks the broader valleys with cultivated bottoms are primarily due to preglacial weathering and "graben" faulting. Of these Kemp[13] says that the bordering "faults and their escarpments were doubtless much freshened by the Labradorean ice sheet, which plucked away from their faces the loose rock, sheeted by the parallel faults. In this way the relief was heightened during the Glacial Period." As figured by Kemp, these scarps are too steep for even forest growth over a large part of the area of their faces. But, as it has been shown that all these regions are in general agriculturally unfit for other reasons than glaciation, there is no need to consider in detail the effect which heightening of their relief by such differential glacial erosion has had on their comparatively small crop production. It will suffice to state that the general result was to give rise to steeper slopes and to that extent introduce an unfavorable condition affecting even the forest growth.

The contact line of igneous rocks and sedimentary strata, or better, where the latter overlap the former is the most important occurrence where glacial erosion has been effective in increasing the diversity of relief due to the juxtaposition of resistant and relatively non-resistant rock formations. The St. Lawrence, Mohawk and Hudson-Champlain depressions, the Great Lakes valleys and the Connecticut Valley are the most conspicuous examples of this kind in the glaciated portions of North America; the Scottish Lowlands in Europe are not of exactly the same type. Although all these areas, and similar occurrences of lesser note were, without doubt, depressions developed in preglacial times, yet Tarr[14], quoting various authorities, assigns to glacial erosion a part in the carving of each of the Great Lakes, the Hudson-Champlain and the Mohawk valleys. Bowman[15] cites glacial erosion as a factor in the development of the Connecticut Valley. As the St. Lawrence Valley and the Scottish Lowlands were also channels of considerable ice movement, ice-scour was probably influential to some extent in giving them their present topographic expression. However, later glacial deposits largely obscured the effect of this on their bottoms, and, since such depressions were preglacially bordered by escarpment and fault slopes, glacial erosion, in its visible phenomena, probably did no more than steepen these slopes and clear away such

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[13] Kemp, J. F.: Physiography of Adirondacks, *Pop. Science Monthly*, Vol. LXVIII, March, 1906, p. 203 and Fig. 8.

[14] Tarr, R. S.: The Physical Geography of New York State, New York, 1902, pp. 183, 189, 206, 239.

[15] Bowman, I.: Forest Physiography, New York, 1911, p. 660.

talus accumulations as may have given rise to a gentle incline from their base to summit. The net result of such action as effecting agriculture would be to enlarge the area of level land at the base of the cliffs.

That this was specifically the case in the Mohawk Valley and that, in addition, glacial erosion may have added considerably to its width of cultivable area is indicated by Brigham[16] who says the valley "continues broad and open toward Little Falls with a concavity of bounding slopes which suggests powerful glacial erosion." As to the probability of effective glacial erosion under such conditions of rock structure Bell[17] says: "When unaltered strata lie at low angles on a nucleus of igneous rock, and the ice moved off the latter against the upturned edge of the stratified rock great erosion has always taken place." The Mohawk valley, in the region referred to by Brigham, constitutes a trench 1,500 feet deep and from twelve to twenty miles wide.

Since the water surfaces of the Great Lakes present unbroken plains, it cannot be strictly held that glacial erosion in carving their basins has increased the diversity of relief. But as so much area has been, by this means, made unavailable for agriculture, the effect of such erosion may well come under this head. Considered from this viewpoint the elimination of the large area of the Great Lakes basins, which were preglacially probably river valley plains, was an important, harmful effect due, in part at least, to glacial erosion. In this connection it is, however, interesting to note that land areas have been reclaimed as well as lost by glacial action. Thus in Europe the Baltic would overflow wide tracts of the plains of Northern Germany if the glacial deposits of that region were removed, for these frequently descend below the level of the sea[18]. Similar encroachment of the sea on the land would occur in England and North America if the present glacial deposits in the valleys were to be removed.

Some of the instances cited above could as well have been referred to as special cases of accentuation of relief, by glacial erosion, of the more general condition where the ice sheets invaded regions of bold preglacial relief. Indeed the effects on agricultural relations under all three of the conditions are very similar. But the most striking development of these effects occurs along the northern

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16 Brigham, A. P.: Topography and Glacial Deposits of the Mohawk Valley, *Bull. Geol. Soc. of Amer.*, Vol. 9, 1898, p. 184.

17 Bell, Rob: On Glacial Phenomena in Canada, *Bull. Geol. Soc. of Amer.*, Vol. 1, 1890, p. 296.

18 Geikie, J.: Ice Sculpture, New York, 1908, p. 244.

and western edge of the Appalachian Plateau in western New York and northwestern Pennsylvania and Ohio. In those regions the ice moved from a comparatively level plains region into a maturely dissected upland, with the result that its main lines of flow were directed by the north-and-south valleys extending parallel to the direction of ice movement; although the ice did overtop the higher elevations in at least the northern part of the district. The heightening of relief by glacial erosion under such conditions of concentration of ice flow, has, perhaps, its most marked expression in the Finger Lakes region of western New York, where it gave rise to what have been termed "through" valleys. Such valleys extend uninterruptedly through from the St. Lawrence to the Susquehanna drainage systems, the former rock divide between them having been cut away by the ice, so that the divides between north-and-south flowing streams are now illy defined and situated on low morainic or other glacial deposits. The walls of such valleys are steep, their sides straight and they show a marked absence of projecting spurs.[19] In some places the steepness is sufficient to make the valley wall a cliff. These valleys have been profoundly modified by glacial erosion, both by deepening and broadening. Not only the main north-and-south valleys, but also the transverse east-and-west valleys show to some extent these effects of ice-scour, and to a less marked degree the tributaries of secondary size reveal the same characteristics. The sides of the valleys are forest-covered, but their broad flat bottoms are all under cultivation. It is clearly apparent that the area of valley agricultural land in this upland region has been increased by the heightening of the relief by glacial erosion.

Glacial erosion, in heightening relief, exerted on general agricultural relations one detrimental effect which, though indirect, deserves mention. It made farm transportation in the eroded plateau district much more difficult. The upland areas are fairly level, and though they are less valuable than the valley lands, they measure a large portion of the area. The trunk transportation lines, the railroads and the markets are in the valleys. The roads from these to the hill farms often need to go straight uphill for from 400 to 800 feet. In some places the grades are so steep as to prevent access to the nearest railroad station. This makes the growing of such bulk crops as potatoes, to which the soils are

[19] Tarr, R. S., Watkins Glen-Catatonk Folio, No. 169, U. S. Geol. Survey, 1909, Field Ed., pp. 16, 18, 21, 218, 223.

adapted, often unprofitable.[20] While not in this plateau section, Crawford Notch (Fig. 2) in New Hampshire illustrates beautifully the character of such ice-eroded and steepened slopes. The valley here was also parallel to the general direction of ice movement, northwest to southeast, as shown by the striations, and no doubt[20a] was similarly carved out by the deeper, main ice currents.

It is perhaps inaccurate to ascribe any *increased* diversity of relief in the glaciated regions to depositional accumulations, because the morainic ridges, drumlins and other forms of glacial deposits that rise above the general level of the land rest, as a rule, on basement deposits of the same origin, of wider areal distribution and of more level topographic expression. These basement deposits mask the underlying rock topography which, under the moraines and other elevated forms of drift deposit, may have had a much stronger relief than these give the land at present. As this, however, is only conjectural while the moraines actually exist, some account must be taken of the effect of their elevations and slopes on agricultural operations.

On the map, Fig. 3, are indicated the positions of the morainic belts and drumlin areas of the eastern agricultural part of North America. This map, however, exaggerates the relief distribution of such forms because the width and continuity of the bands as shown is too great, and because comparatively level lands are included within the tracts delineated as morainic and drumlin areas. While some of the morainic masses rise to heights of 150 to 300 feet and are distributed over zones three, five or even fifteen miles in width, making an exceedingly irregular topography, others are little more than broad, smooth, masses, rounded banks of drift.[21] Drumlins also vary from massive hills 100 to 200 feet high, which may be three or four miles long, to indefinite swells in the drift surface. In Europe, moraines are conspicuously developed only in south Norway and Sweden, on the Baltic Ridge of northern Germany and in Finland and West Russia. Drumlins occur in Ireland and Scotland but only sparingly, if at all, in continental Europe.

Considered as topographic irregularities the occurrence of the larger moraines and drumlins must on the whole be counted as a detriment to agriculture in that their slopes are often too steep

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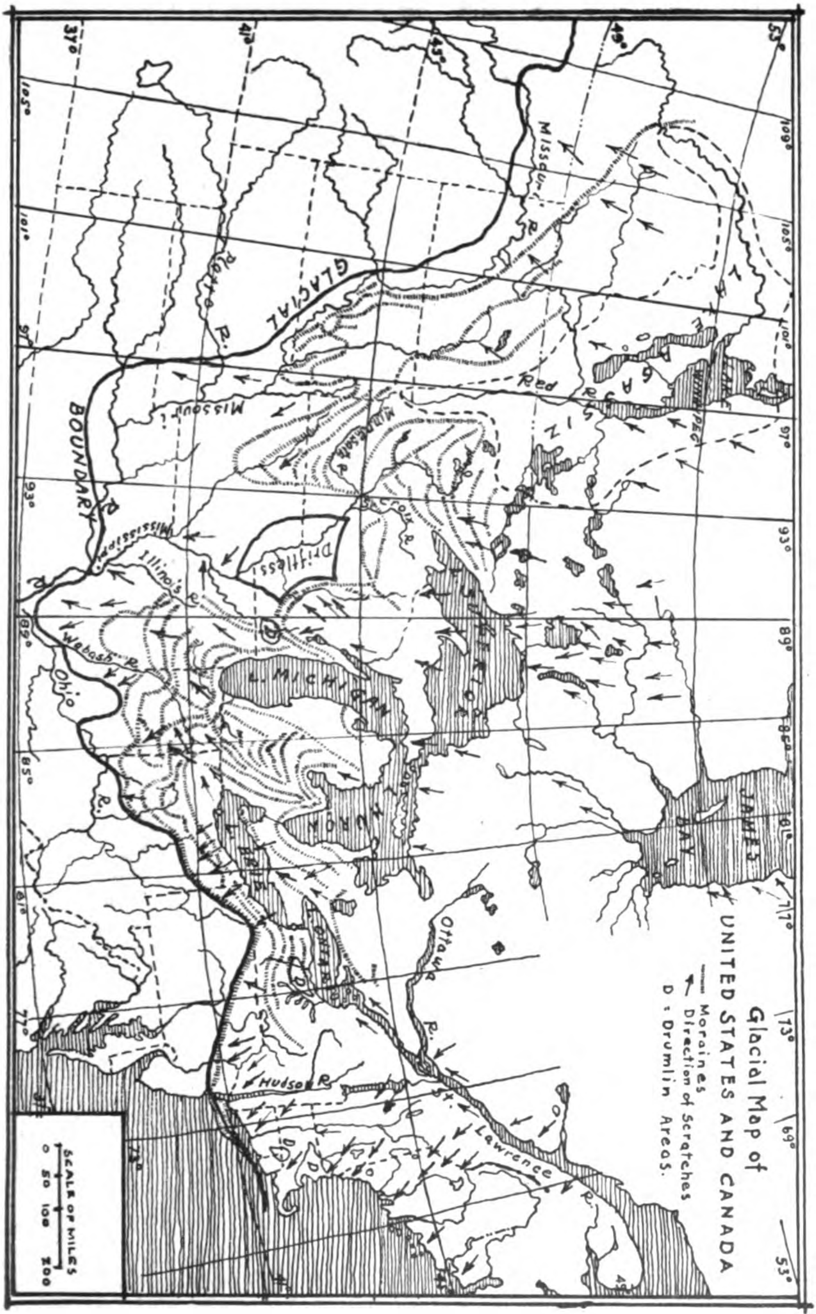
20 Warren, G. F., and K. C. Livermore: An Agricultural Survey. Agri. Exp. Sta. of the College of Agric., Cornell Univ., *Bull.* 295, pp. 437, 458, 560.

20a Since this paper was written J. W. Goldthwait in an article, "Glacial Cirques near Mt. Washington," *Amer. Journ. Sci.*, Vol. XXXV, Jan. 1913, p. 12, cites Crawford Notch specifically as a probable example of a glacially steepened "through valley."

21 Chamberlin, T. C., in Geikie, J.: The Great Ice Age, 3rd Ed., London, 1894, p. 741.


Glacial Map of
UNITED STATES AND CANADA
Moraines
Direction of Scratches
D : Drumlin Areas.
SCALE OF MILES
0 50 100 200
GLACIAL
BOUNDARY
Driftless
L. MICHIGAN
SUPERIOR
HURON
L. ERIE
ONTARIO
JAMES
BAY
Missouri R.
Platte R.
Mississippi R.
Illinois R.
Wabash R.
Ohio R.
Hudson R.
Ottawa R.
St. Lawrence R.
Red R.
St. Croix R.

for cultivation, and in that the irregularities of a well-developed morainic or drumlin zone make it difficult country to bring under the plow. But since the relative area occupied by moraines of such strong expression is small, the loss due to this is probably not great. Where the moraine is developed in broader, lower tracts of thickened drift its slightest slopes often promote good drainage conditions without interfering with tillage operations. Soils on drumlin slopes are usually well drained and in New York are well adapted to fruit trees, especially apples and cherries.[22] On the other hand the depressions of a typical kettle moraine area, low-lying pockets with rims uncut by drainage gaps, are consistently shunned by fruit growers and truck gardeners because they have poor air drainage. The cold, heavier air slides down the slopes and collects at the bottom of such pockets, as they have no outlets at the lower levels.

(b) Modification of Relief and its Agricultural Consequences. In the literature descriptive of regional glaciation occur a multitude of references to the effect that the ice invasions resulted in a general reduction of the preglacial relief and that this was accomplished both by glacial erosion and by deposition of drift. In order to understand why this should be the case it is necessary to consider for a moment the nature of the preglacial topography in representative areas and the way in which such topography would be affected by glacial processes.

Processes of weathering, and the erosion of running water, tend to etch the land surface into an intricate relief pattern, bringing into topographical prominence all structural and petrographic differences that may exist in the bed rock of a given region. While the beginning and end stages of a normal cycle of erosion are marked by relief of little expression, it must be remembered that the youthful stage is of very short duration, and that undissected peneplains are practically non-existent in the geological present. Some phase of the middle stage of normal topographic maturity is common on the land surfaces of the globe.

While it cannot be maintained that the preglacial erosion surfaces of the regions invaded by the continental ice sheets had all been developed to a typical stage of maturity in the normal erosion cycle, it is true that the plains areas of both Europe and America that were covered by the glaciation had a much more diversified

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22 Whitney, Milton: Use of Soils East of the Great Plains Region, U. S. Dept. of Agric., Bur. of Soils, *Bull. 78*, p. 106.

topography due to dissection than they now possess. Over the broad interior of North America, a peneplain developed in the Tertiary had been uplifted and dissected to various stages of maturity before the ice invasions of the Pleistocene occurred. In eastern and southern New England, an extensive peneplain, developed in the Cretaceous, was uplifted and much dissected in the Tertiary—in fact again reduced to local peneplains over the areas of less resistant rocks. But a later uplift resulted in the further dissection of the more resistant portions of the Cretaceous peneplain and a redissection of the local early Tertiary peneplains. In Europe a very irregular and disordered rock structure underlies the North German Plain; and the preglacial plains of western Russia probably also had a topography of some diversity due to denudation. Similarly the agricultural plains of central and southeast England, north of the Thames, possessed a diversified topography developed by the action of normal denuding agents on rocks of varying age, resistance, and elevation above sea level.

Nor is it necessary to confine this characterization to plains areas. A multiplicity of minor topographic irregularities, ridges and furrows, is typical as well of the surface of the major relief features of a mountain country, or of the pyramidal masses of a dissected plateau region. As these tend to the old age stage their lines become more flowing; but, as long as they have a significant elevation, variations in structure will make an impress on the topography of their slopes and summits. This would be true of the preglacial Adirondacks, the Catskills, the northern portion of the Appalachian Plateau and the New England members of the Appalachian mountain province. In Europe it would apply to the Southern Uplands of Scotland, the English Lake Region, and the mountains of Wales.

Both the erosional and depositional processes of glacial ice in continental masses are peculiarly adapted to the destruction of just such surface irregularities as it appears must have been characteristic both of the plains areas and the sections with larger relief, now constituting the glaciated regions, preceding the Pleistocene. The action of the ice may best be likened to that of a huge rasp, scouring off the high points and filling the hollows between them with the debris so acquired or, indeed, with that carried from the remoter regions central to the ice dispersion and of predominant erosion. Where the initial relief was great, *i. e.*, in the mountain and plateau regions invaded by the ice, the erosional effect in general was to round off the summit ridges, to replace peaks by dome

forms and to make the valley slopes smooth and regular, eliminating or truncating spurs. If, indeed, the valleys were in some instances greatly deepened and their slopes made steeper, they were at the same time widened and their floors made essentially level by drift deposit on the retreat of the ice. This is true of the valley of the Connecticut in New England, of the Mohawk Valley and the larger valleys of the Adirondacks, of the Catskill Mountain valleys; and applies also to the through valleys in the Appalachian Plateau in New York and western Pennsylvania and to the Appalachian valleys and the Triassic lowland area of northern and western New

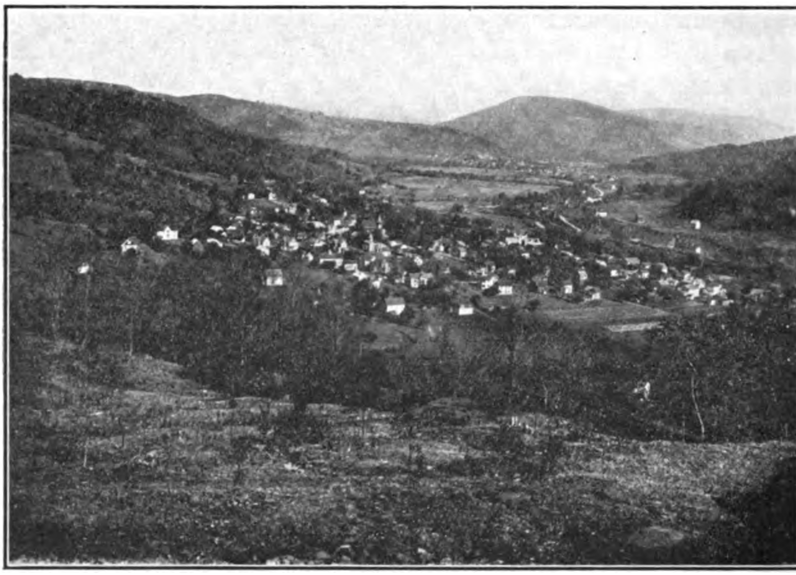

FIG. 4—Valley of the East Branch of the Delaware River at Margaretville, N.Y. Shows filling and leveling of the valley floor with drift deposits. The valley sides are ice-eroded, showing characteristic striation and grooving at many points, locally.

Jersey. The same set of phenomena are characteristic of the Scottish Lowlands, the Lake District of England and the mountain region of Wales. Photographs of the larger valleys of any of these regions almost invariably illustrate these conditions more or less typically. (Fig. 4.)

Such modification of the relief by glaciation, in regions having topographic units of marked difference in elevation and large mass, was not, however, wholly favorable to agriculture. The slopes and summits of the uplands, which may preglacially have had a deep cover of residual soil, were most attacked by the ice erosion, as they

offered the greatest obstacles to the ice movement. Consequently the residual soil cover and the rotted rock beneath were commonly wholly removed from the exposed areas, and, because of the lobation of the ice on its retreat, glacial deposits in such regions were, by marginal and subglacial streams and moraine accumulation, largely concentrated on the valley bottoms. As a result, glacial deposits are usually found to thin out on the hill slopes and tops, only a thin veneer of rocky till being left behind to cover the glacially eroded, fresh-rock surfaces. The thinness and stoniness of the upland soils due to glaciation must, therefore, be considered as a detrimental effect of glaciation on agriculture. But as this thinning of the soils on the slopes and summits has probably led to a conservation of larger areas to forest than would have been the case if the thicker preglacial soil cover had remained intact and available for cultivation, it may be that the value of the forest and the effect of its cover on the rate of run-off are also very important compensating factors.

The New England region as a whole includes both the mountainous areas to the west and north and the dissected peneplain area to the south and east. Taken together these districts are often cited as typically illustrative of the harmful effects of glaciation on agricultural conditions. It is, therefore, worth while to make special mention of the features of this region in this connection. It has been conjectured that the interstream areas, constituting the uplands of the dissected peneplain, were preglacially blanketed to a considerable depth with residual soil and rotted rock, despite the Tertiary uplift and dissection. All of this weathered material the ice scoured off down to fresh rock, and doubtless it also wore down the elevations and reduced the inequalities of the uplands to some extent, though these are not considered to have been great. In so far, however, it modified the preglacial relief. In the weaker structures of the fresh rock the ice also commonly eroded basins. In the mountainous portions of New England glacial erosion was even more effective and probably sufficed to round off the ridges quite notably, in addition to removing their surface irregularities and covering of weathered material.

On its retreat the ice left only a comparatively thin veneer of soil on the uplands of the peneplain and the slopes and summits of the higher elevations of the mountain country. Moreover, this soil is often very stony, containing from 20 per cent. to 80 per cent. of boulders, some of them quite large. The large size of these erratics is due to the generally massive and durable character of the

fresh bed rock of the region in which the ice was quarrying in its final erosive stages. Such fresh bed rock material, because it was acquired last, naturally formed the bulk of the deposits laid down on the melting away of the ice. In patches on the upland, and quite uniformly in the valley bottoms, thick deposits of finer grained outwash and other glacial materials were accumulated.

Thus it appears that New England was unfavorably affected agriculturally by the glaciation because a large proportion of the preglacial level lands of the region consisted of the interstream upland areas where glacial erosion was most effective and deposition feeble, and the glacial soils left behind consequently thin. In what were probably, in many cases, preglacially, rocky gorge valleys, thick deposits of drift were laid down, and their bottoms accordingly built up, leveled and widened. But these areas comprise a relatively small percentage of the whole region. Moreover, the thin soils of the uplands were cluttered by large boulders because the bed rock of the region was structurally massive and durable, furnishing large fragments to the ice erosion, little susceptible to glacial grinding while in transport.

It is, however, precisely because (in direct contrast to the New England region) the great agricultural areas of both North America and Europe were essentially plains regions, possessing topographic diversity of great detail but of a relatively low order of relief, and regions typically underlain by stratified rocks, thin bedded, much jointed and little resistant, rather than massive and durable, and regions wherein the ridge lands were of lesser area than the low lands, that glacial modification of relief both by erosion and deposition has been so beneficial a factor in determining agricultural conditions. The narrow, little-resistant ridges, were readily worn down. The minor irregularities of the surface were literally submerged in glacial deposits twenty, fifty, one hundred and even five hundred feet thick. The material of these deposits was essentially fine grained, available for tillage, because of the character of the bed rock from which it was derived. Over the extensive areas of the plains the ice spread out in a thick continuous sheet and, on its retreat, confluent outwash and till deposits made great reaches of strikingly level land. This leveling process is possibly the most important glacial factor influencing agriculture. To it, primarily, Whitbeck[23] ascribes the greater agricultural prosperity of the glaciated as contrasted with the driftless portions of Wisconsin:

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23 Whitbeck, R. H.: Contrasts between the Glaciated and Driftless Portions of Wisconsin, *Bull. Geogr. Society of Philadelphia*, Vol. IX, No. 3, July, 1911, p. 19.

"Glacial filling, and to a smaller extent, glacial erosion, have made the drift covered portion of the state smoother than is the driftless region. This has increased the proportion of land that can be tilled." Furthermore, it must not be forgotten that, since the grains constitute the most important staples in the food supply of the world, it is of exceeding consequence to agricultural prosperity that the larger areas of tillable land in any considerable region be suitable for their growth. In this connection the levelness of the glacial plains is a factor of great significance. Altogether it is probable that the reduction in relief brought about by glaciation is the most important of the beneficial effects that have made the ice-invaded regions of greater agricultural value than adjacent lands of similar history, except for this influence.

(c) Effects of Relief Changes on Ground Water Conditions as Affecting Agriculture. In the regions of predominant glacial accumulation, which are, as far as the glaciated regions are concerned, coincident with that portion of such areas as are climatically available for agricultural development, the soil mantle is uncommonly thick. Its average depth in northern New Jersey is calculated at between twenty and forty feet. Chamberlin estimates the average thickness of the drift in the Upper Mississippi Basin, in southwestern Ontario and the southern portion of the great northwestern plains of Canada to be 100 feet. Over the general area of the North German Plain Helland found that the glacial deposits averaged 150 feet in thickness. The presence of such deep accumulations of unconsolidated material has an important bearing on the soil moisture and water capacity of the soils of such regions, making both the water supply and its availability to crops much greater. It is true that agricultural regions outside the glacial districts have great thicknesses of residual soil cover, or are made up of great depths of essentially unconsolidated porous material. In regions with a cover of residual material, however, the soil tends to be removed from the slopes by erosion, and under preglacial conditions of topography the soils on the slopes of the Central Plains area of North America were probably comparatively thin. How great the contrast may be is suggested by descriptions of the topography of Indiana in the glaciated area and immediately to the south of it. Thus in the glaciated area: "The valleys begin on the uplands as scarcely perceptible grooves in the compact boulder clay, widen much more rapidly than they deepen, and seldom reach down to rock floor." South of the boundary of the Wisconsin drift

where the country has been little if at all modified by glaciation is found "a region of deep, narrow valleys, sharp irregular divides and precipitous cliffs." "The limit of drift encloses and fits this broken surface as a man's coat fits his shoulders."[24]

The fact that a large part of the Central Plains glaciated area of the United States is underlain by limestone gives additional importance to the present deep filling of glacial drift in connection with water supply and agriculture. As is typically now the case in Kentucky and parts of southern Indiana, these limestone regions probably had a sink hole topography and underground cavern drainage in preglacial times. Under such conditions surface drainage is often practically absent and water supplies from wells are not obtainable. Bowman[25] says: "The Prairie Plains do not have an exceptionally favorable rainfall. There is good reason for believing that were the surface less flat, the absorption of rain water less pronounced, the original forest would have been much more restricted." The thick drift deposits not only furnish unfailing supplies of water for crops and shallow wells throughout the areas of their distribution, but also, under special conditions, large volumes of artesian water, as on Long Island and at Ithaca, New York,[26] often used for irrigation purposes. These relations of the thick drift deposits to water supply conditions must, therefore, be also counted as one of the important favorable influences on agriculture due to glaciation.

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[24] Dryer, C. R.: Studies in Indiana Geography, Inland Pub. Co., Terre Haute, Ind., 1906, p. 19.

[25] Bowman, I.: Forest Physiography, New York, 1911, p. 460.

[26] Tarr, R. S.: Artesian Well Sections at Ithaca, N. Y., *Journ. of Geol.*, 1904, Vol. XII, No. 2, pp. 69–82.

(To be concluded)

THE ANNUAL VARIATION OF ATMOSPHERIC PRESSURE IN THE UNITED STATES

(STUDIES ON CLIMATE AND CROPS: 6)*

By HENRYK ARCTOWSKI

The ordinary maps representing the distribution of atmospheric pressure over the globe or over certain parts of the earth's surface give the mean heights of the barometer reduced to 0°C. (32°F.), the sea level and the normal gravity at 45° latitude. The correction to a standard temperature is necessary to avoid the systematic instrumental error due to the expansion of mercury, which is a function of temperature. The correction to the sea level, on the contrary, although necessary for the tracing of maps, is to a certain extent artificial, since, in reality, it leads to a representation of the distribution of atmospheric pressure as it would be if the earth's surface were different from what it is. In the case of continental areas, with extensive plateaus and mountain ranges, as in the west of the United States, for example, the difference may be great for a large number of stations between the corrected sea level pressures and those really observed. By reducing the readings of the barometer to sea level we add to the observed weight of the column of air, above the surface of the ground, the weight of an assumed column of air extending (under the given condition of temperature and vapor tension) beneath the surface of the ground down to sea level. Of course the thickness of the atmosphere above the summit of a mountain is less than at the foot of the mountain; the pressure at the summit is therefore smaller than down below. If we inscribed on a map the observed values we would simply obtain a likely resemblance of the hypsometrical map and such a representation of things would be of no use. But the column of air beneath the surface of the ground does not exist, and, therefore, if for the purposes of our investigations we have to study the transport of air masses,—from one hemisphere to another for example[1]—the unreduced values must be used.

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* For previous papers in this series see *Bull.*, Vol. 42, 1910, pp. 270-282 and 480-495, Vol. 44, 1912, pp. 598-606 and 745-760, and Vol. 45, 1913, pp. 117-131.

[1] Researches on this particular subject have been made long ago by W. Koeppen, J. Kleiber and A. v. Tillo. The most important and more recent papers on the subject are:—O Baschin: Zur Frage des jahreszeitlichen Luftaustausches zwischen beiden Hemisphären, *Zeitschr. der Gesell. für Erdkunde zu Berlin*, Vol. 30, 1895, pp. 368-374;—R. Spitaler: Die periodischen Luft-

In my former investigations on atmospheric pressure I have shown how important some of the abnormal changes may be.[2] So far I have only taken into consideration yearly means. To study seasonal anomalies, or those concerning a month or two, it was necessary to begin the researches by an investigation of the normal seasonal changes.

The seasonal transport of air masses over continental areas is a complicated phenomenon, and, in my opinion, the knowledge of these complications is of real importance in the study of climatic variations.

Imagine a temporary change in the quantity of energy radiated from the sun, a small variation of the "solar constant" during, let us say, a month of time. The thickness of the atmosphere above high plateaus is less than above low ground or the sea. The reaction of the change must therefore be felt differently at high altitudes than near sea level and a perturbation due to this difference must result. Now, all other conditions remaining the same, as far as may be, the reaction will again be of a quite different character according to the time of the year when it occurs, whether during the summer or the winter months. In summer, temperature being high, the atmosphere is expanded and the proportion of air above high level stations is therefore increased. The results of the observations taken at the summit of Pike's Peak (altitude: 14,111 feet), from 1874 until 1887, may serve as an illustration. The mean barometric height being 17.735 inches, the departures of the mean monthly means from this value are:[3]

January....	—0.263	May........	+0.028	September..	+0.199
February...	—0.250	June.......	+0.194	October.....	+0.065
March......	—0.194	July........	+0.323	November..	—0.094
April.......	—0.131	August.....	+0.310	December..	—0.181

The curve expressing these figures graphically is extremely regular and represents a simple oscillation, identical to that of the annual

massenverschiebungen und ihr Einfluss auf die Lagenänderung der Erdachse, *Ergänzungsheft zu Petermanns Mitt. No. 137*, Gotha, 1901;—O. Baschin: Die geographische Verteilung des Luftdrucks und deren Aenderung vom Sommer zum Winter, *Zeitschr. der Gesell. für Erdkunde zu Berlin*, 1907, pp. 246-253;—W. Meinardus: Die mutmassliche mittlere Höhe des antarktischen Kontinents, *Petermanns Mitt.*, Vol. 55, 1909, pp. 304-309 and 355-360;—W. Koeppen: Die Verschiebungen der Atmosphäre im Jahreslaufe und die Höhe des antarktischen Kontinents, *Meteorol. Zeitschr*, 1910, p. 488. The seasonal changes of the distribution of atmospheric pressure in the northern hemisphere, reduced to sea level, may be studied from the maps of monthly normal departures from annual normal pressures published by H. H. C. Dunwoody, (Summary of Internat. Meteor. Observat., *Weather Bureau Bull. A.*, Washington, 1893.)

[2] *Comptes Rendus de l'Acad. des Sciences de Paris*, Vol. 148, 1909, p. 589.

[3] Frank H. Bigelow: Report on the Barometry of the United States, Canada and the West Indies, *Report of the Chief of the Weather Bureau, 1900-1901*, Vol. II., p. 558.

variation of temperature. In January, when the temperature is lowest, the atmospheric pressure is lowest at the summit of Pike's Peak simply because, the air being dense, a smaller amount of air surpasses the elevation of the mountain. In July and August, on the contrary, when the temperature is highest, the air is expanded, it is less dense; a greater proportion of the atmosphere is above the summit of the mountain and this is why the measured weight of air is greater.

It is obvious therefore that in the case of the North American continent, where high plateaus occupy large areas, the seasonal changes in the distribution of the air masses must present local characteristics of some interest.

To begin with, let us compare the curves of the adjoining diagram (Fig. 1) representing the annual variations of atmospheric pressure at some low-level stations along the Atlantic.[4] In Washington we notice a simple oscillation of the barometric height: it is lowest during May, June and July and highest in December and January. Going south the curves are more complicated: they show a tendency to adjust themselves to the double oscillation observed in Florida and Cuba, with a principal maximum in January and a less important one in July. Going north from Washington we again notice complications,

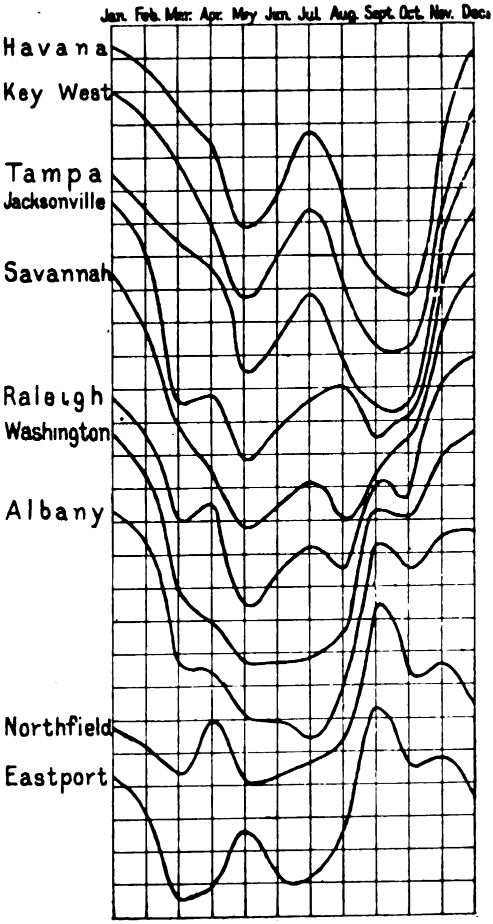

FIG. 1—Diagram representing the annual variation of atmospheric pressure at stations of low elevation along the Atlantic coast.

[4] The monthly means utilized have been taken from the report by Bigelow cited above.

and the curve of Eastport is nearly the reversed curve of Key West.[5]

It is not only along the Atlantic coast that the annual variation presents such distinct types. In Amarillo, Tex., the barometer is below the average from January to June and above from July to December, with the minimum in March and the maximum in July. In Denver, Colo., we observe a simple and regular oscillation; minimum in March, and maximum in August; the same in Salt Lake City where the minimum occurs in May and the maximum in November; in Red Bluff, Cal., the same, but the mimimum occurs in August and the maximum in December. Farther north, in Tatoosh Island, in the state of Washington, we see just the contrary: maximum in July and minimum in December, but there the yearly variation is represented no more by a simple oscillation.

In order to understand the correlations between all of these different types of variations it is necessary to study the problem geographically. For this reason I have constructed a number of maps which I will now discuss. The figures utilized to draw these maps have all been taken from the tables designated Table 43 in Bigelow's report (pp. 429-623) giving, besides the results of the observations made from 1873 to 1899, the averages of the monthly and yearly means and the departures. Of course for the majority of stations the series of observations is shorter than the period of years taken into consideration by Bigelow. In many cases, therefore, the departures are far less correct than those where the series of observations is complete. This lack of accuracy, or defect of homogeneity, cannot, however, affect my deductions.

Taking the differences between the highest and lowest departures from the annual mean for each station and inscribing these differences on a map, it was easy to draw the lines of equi-amplitudes I do not reproduce this map, which represents the geographical distribution of the amplitudes of annual variation, since it can be easily described.

The highest yearly amplitudes occur on the frontier of Mexico. In Yuma, Ariz., the mean departures for January and June are +0.166 and —0.141, which makes an amplitude of 0.307. In Rio Grande City, Tex., the extreme departures are +0.128 and —0.103, also occurring in January and June. The disposition of the lines of equi-amplitudes show that four tongues or ridges of high values

[5] The July maximum is subject to interesting variations. The average departure from the yearly mean is +0.008 inches at Key West. The extreme values were observed in 1877 and 1892, when the departures from the corresponding yearly means were —0.027 and +0.054. The changes in the yearly variation curves, and especially those of the July maximum, seem to demonstrate certain correlations with sun spot frequency.

extend from Mexico, this center of greatest yearly variations, and gradually diminish toward the north. The first ridge follows the Californian valley and goes as far north as Tatoosh Island, Wash. The figures are: Yuma 0.307, Fresno 0.291, Sacramento 0.274, Red Bluff 0.273, Roseburg 0.125 and Tatoosh Isl. 0.131. The second ridge goes northeast from Yuma (Phoenix 0.277) and then turns north (Lander, Wyo., 0.209) and northwest (Boise, Idaho, 0.196). The third ridge starts from Rio Grande City, Tex., and follows the outline of the plateau region along the 97th meridian, as far as the Canadian border line. At Moorhead, Minn., the amplitude is still as high as 0.171. The fourth and least characteristic ridge follows the Atlantic coast and extends from the Gulf of Mexico to Nova Scotia.

Now, between these four ridges, like three fingers coming from the north, we have three characteristic lines of lowest values of the yearly amplitude, increasing from the north toward the south. Between the first and second ridge we note the figures: 0.073, 0.084, 0.135 for Seattle, Wash., Portland, Oreg., and Winnemucca, Nev. Between the second and third ridge we have the following line of lowest values: Havre, Mont., 0.061, Rapid City, S. Dak., 0.082, North Platte, Neb., 0.101, Dodge, Kan., 0.126, Amarillo, Tex., 0.135 and El Paso, Tex., 0.150. And finally from the Great Lakes, where the amplitudes are lowest (Sault Ste. Marie, Mich., 0.071), the values are small along the Appalachians as far south as Atlanta, Ga., where the amplitude is only 0.119.

To summarize therefore: there is a minimum of annual variation in the north and a maximum in the south, and, across the United States, a fork of three depressions of these values extends from the north and a fork of four ridges from the south. Moreover, in all probability a correlation exists with the topographical conditions. The number of barometric stations is insufficient to decide upon this question. Notice now that—evidently—it is along the ridges of greatest annual variation that the air is the most drawn and rejected, periodically, with the changes of the seasons.

I have drawn two other maps which it is also not necessary to reproduce. These maps give the month of occurrence of the yearly maximum and minimum. If the annual variation were represented everywhere by a simple oscillation with one maximum and one minimum, things would be simple. But it is not so. Certain areas have two maxima and two minima, and for some places the variation is even more complicated, so much so that it is difficult to decide. The monthly departures for Seattle may serve as an

example of an unsettled yearly variation: —41, +17, —38, +32, —10, +22, +22, —27, —24, +20, —3, +27. These figures are the means of only seven years of observations. But the comparison of the figures for these different years shows that the yearly variation is not settled one way or the other.

I will now consider the geographical distribution of the maxima. Their earliest appearance is in the plateau region: in July at Helena, Mont., and Amarillo, Tex.; in August at Lander, Cheyenne, Denver and Pueblo; in September at Santa Fé and Rapid City; in October at Havre, Mont.; in November all around and enclosing the preceding area, at Spokane, Walla Walla, Boise, Salt Lake City, Flagstaff (a secondary maximum) and, on the other side, at Dodge, North Platte and Williston, N. Dak.

It is of interest to notice that the early appearance of the maximum is not a simple question of altitude. The El Paso station is 3,762 feet above sea level, and the variation is regular and simple: a maximum in December, followed by a gradual decrease until May, and, from then on until the end of the year, the increase is progressive; there is no secondary maximum or minimum. In Phoenix, Ariz., only 1,108 feet high, the July maximum is slightly marked, the figures for June, July and August being —127, —83, —89. This secondary maximum in July is well marked on the annual variation curves of other stations: Baker City, Winnemucca, Carson City, and, on the other side, Dodge and Pierre, for example. But the principal maximum occurs in December.

The December maximum is characteristic for California and also for the margin of the plateaus at Phoenix, Ariz., El Paso, San Antonio and Abilene, Tex., and farther north, towards the northeast of Kansas, and from the Gulf of Mexico on both sides of the Appalachians as far north as Pittsburg, Pa. South and north of this December area the maximum occurs in January at San Diego, Cal., Galveston, Tex., and in Louisiana, Florida and Georgia. The same occurs farther south in Havana, whereas in Santiago de Cuba and Porto Rico the maximum occurs in February. East of the Missouri River, especially in Minnesota, Iowa and Illinois, the maximum of the yearly variation occurs in January; also on the Atlantic coast and in the intermediate region of the Great Lakes. Farther north, in Boston, Portland and Eastport, we note a perfectly characteristic maximum in September and but a secondary maximum in January. Finally, in Marquette, Escanaba and Alpena the maximum occurs in February and in Sault Ste. Marie as late as April. The secondary July maximum of Key West and other southern stations

occurs in August in Jacksonville, and farther north and west many stations display a secondary maximum in September, the month of the principal maximum of the Lake region.

The map giving the occurrence of the yearly minima is also of some interest. The earliest occurrence of the minimum is in March. The area where the lowest values fall in March forms a strip crossing the plateau region from Helena, Mont., towards Amarillo, Tex. The other stations with a well-pronounced March minimum are Baker City, Lander, Cheyenne, Denver, Pueblo and Santa Fe. But in Carson City the principal minimum also occurs in March; and at the stations in Oregon and Washington, where the annual variation is more complicated, the month of March forms one of the minima.

Around the March area we have a few stations where the minimum occurs in April: Flagstaff, Ariz., and North Platte, Neb., for example. In Salt Lake City the barometer is lowest in May, also in Winnemucca, Nev., and San Diego de Obispo, Cal.; but there we have a second minimum in August. This August minimum is to a certain extent characteristic for California, Fresno with a July minimum and San Diego, where the minimum occurs as late as September, forming the exceptions.

South, north and east of the area where the minimum occurs in March we have a great predominance of stations with a May minimum. In North Dakota, Minnesota and Wisconsin the minimum occurs in June, and in the northeastern states, where the annual variation is more complicated, July forms one of the minima. A double oscillation is also very well developed in the southern states, and if we look more attentively at the details we note that this double oscillation can to a certain extent be explained as follows: A first minimum propagates itself from the West Indies towards the north across the Atlantic states, and from the Rocky Mountains towards the Lakes and Canada. The second minimum is this same minimum coming back from the north towards the south.

Going north we may cite: April minimum over Porto Rico and the southern part of Cuba, Florida and all of the Middle States with an extension towards the Lakes and the Atlantic coast as far as Norfolk; June minimum at some of the New England stations, the northwestern states cited above and Canada: going back south: July minimum over New York, Pennsylvania and New Jersey; in August a secondary minimum well pronounced towards the south; in September the principal minimum at Jacksonville and Tampa; in October at Jupiter and Havana; and, finally, in November over

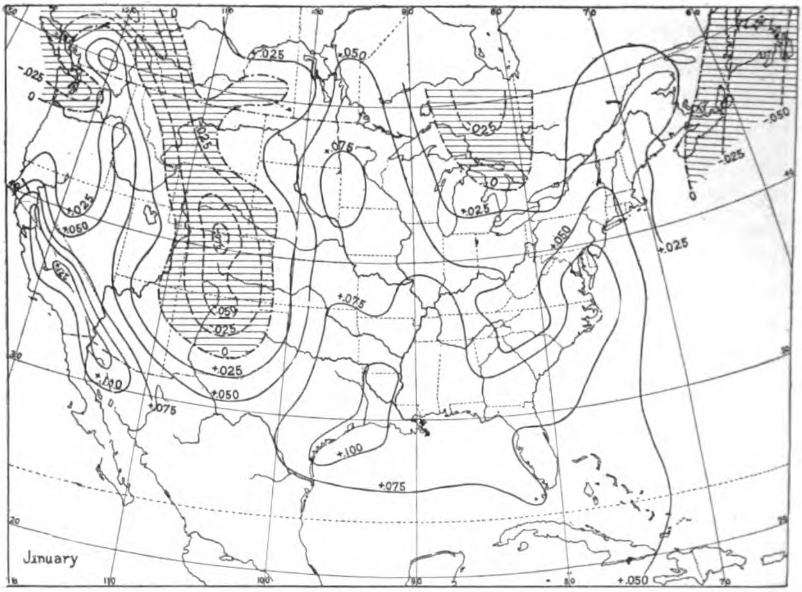
January
+.025
+.050
-.025
0
+.075
+.100
+.140
.050
-.025
0
.025
+.050
.075

FIG. 2

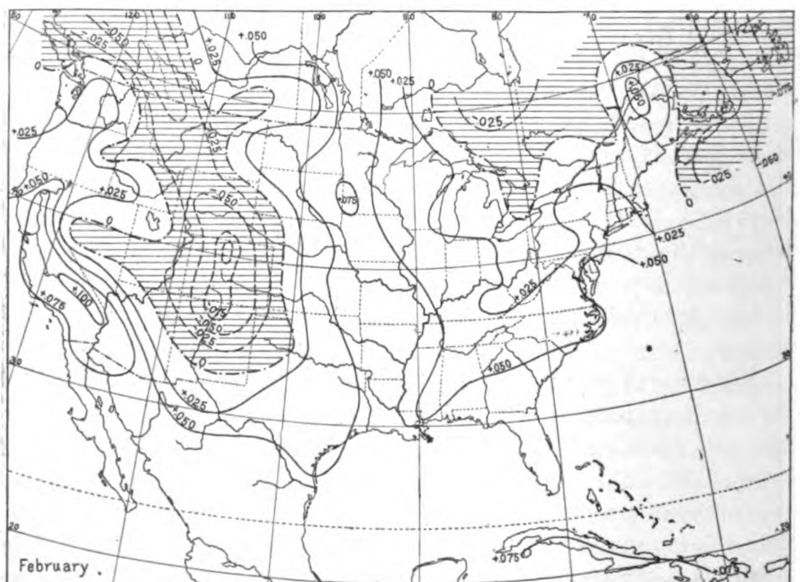
February
+.050
.025
+.025
+.050
0
+.075
+.100
.025
.050
.075

FIG. 3

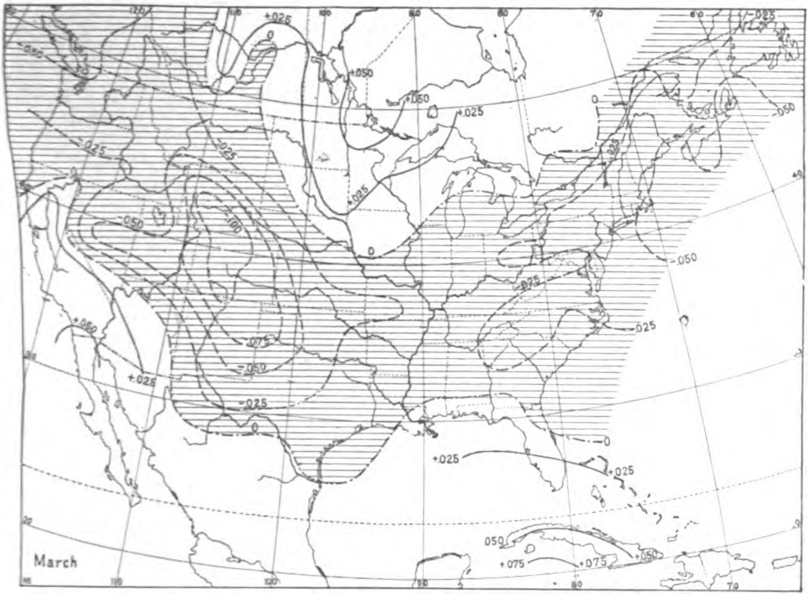

Fig. 4

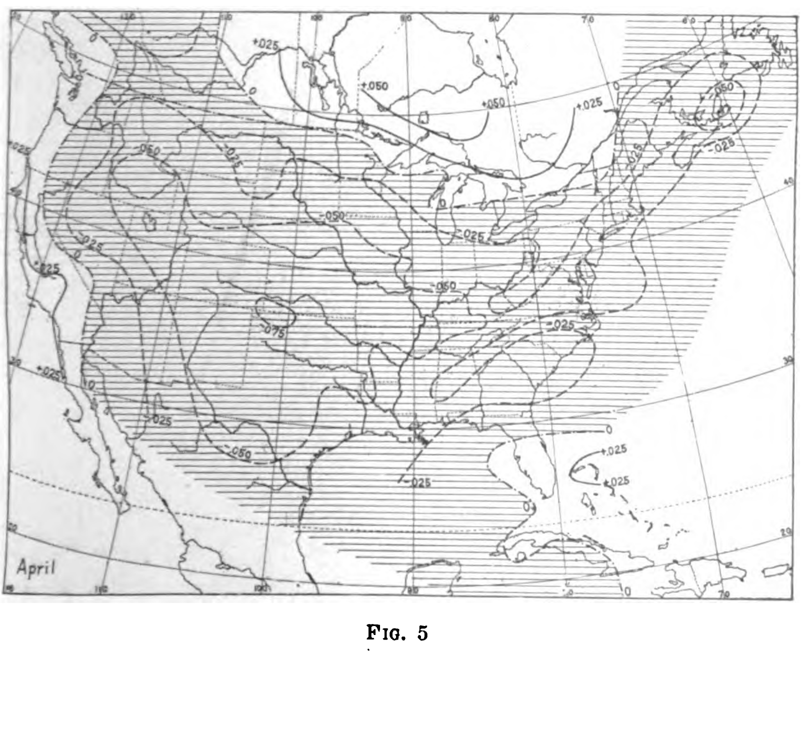

Fig. 5

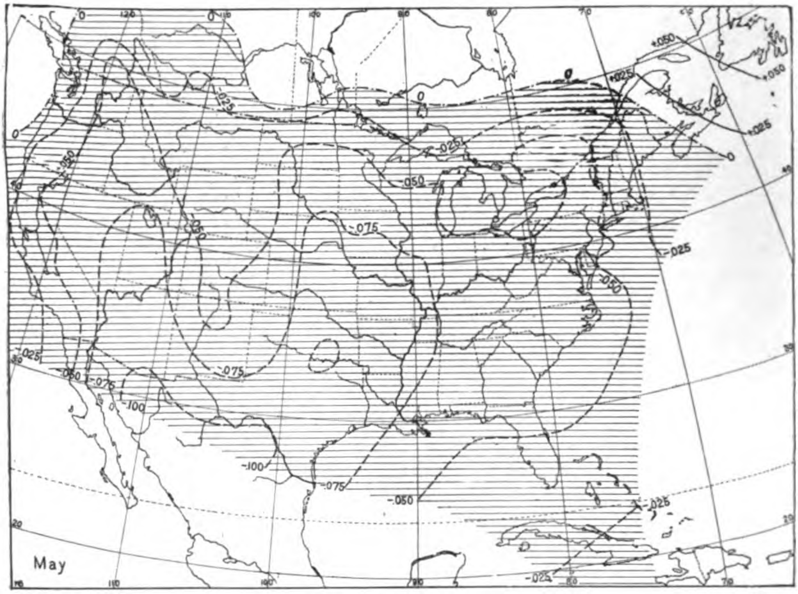

Fig. 6

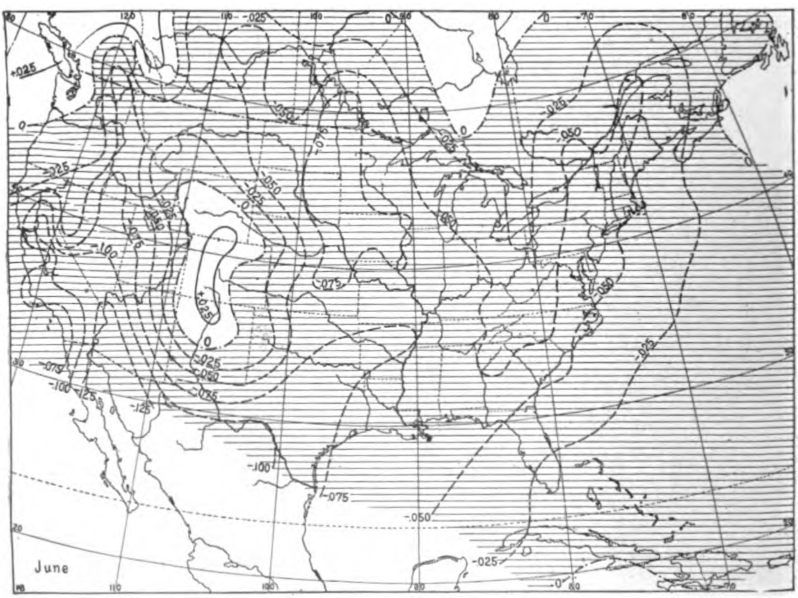

Fig. 7

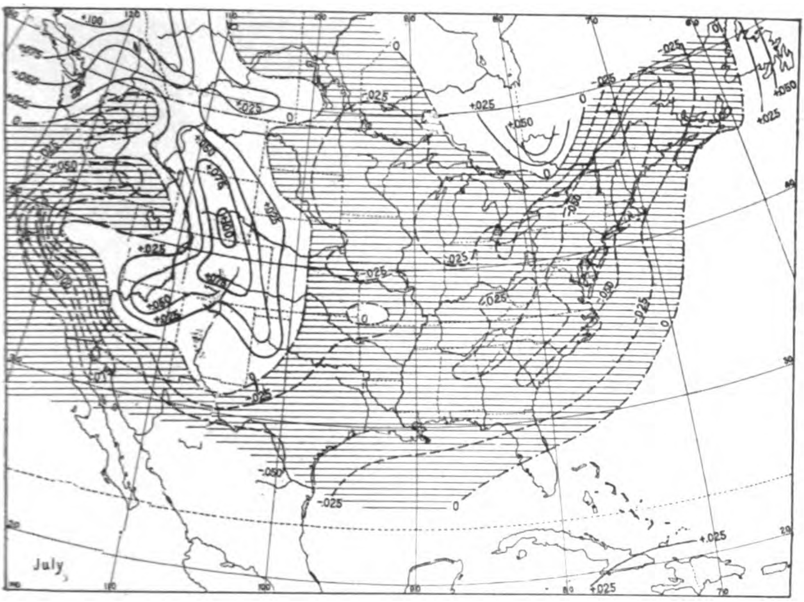

Fig. 8

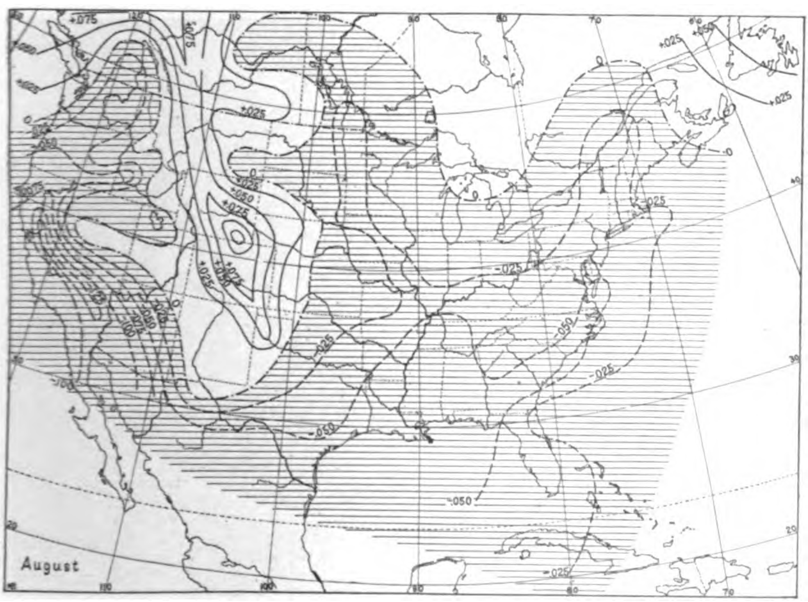

Fig. 9

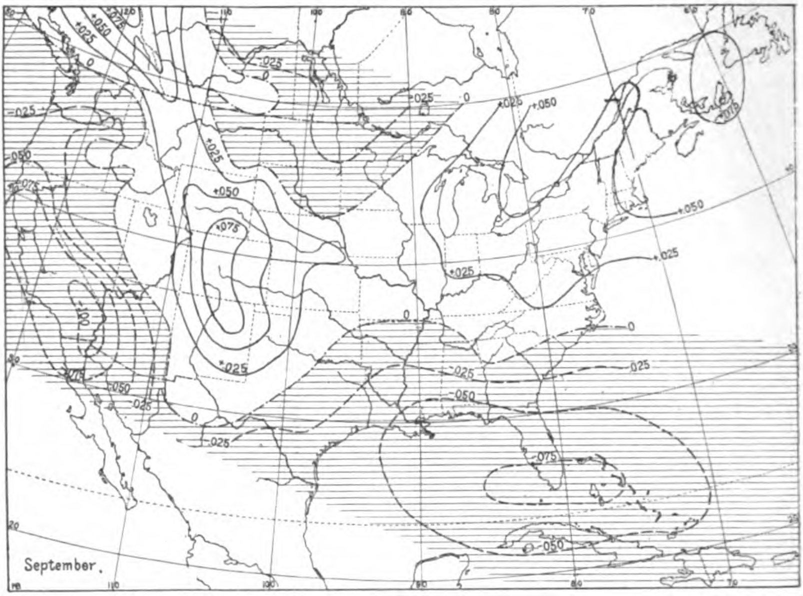

Fig. 10

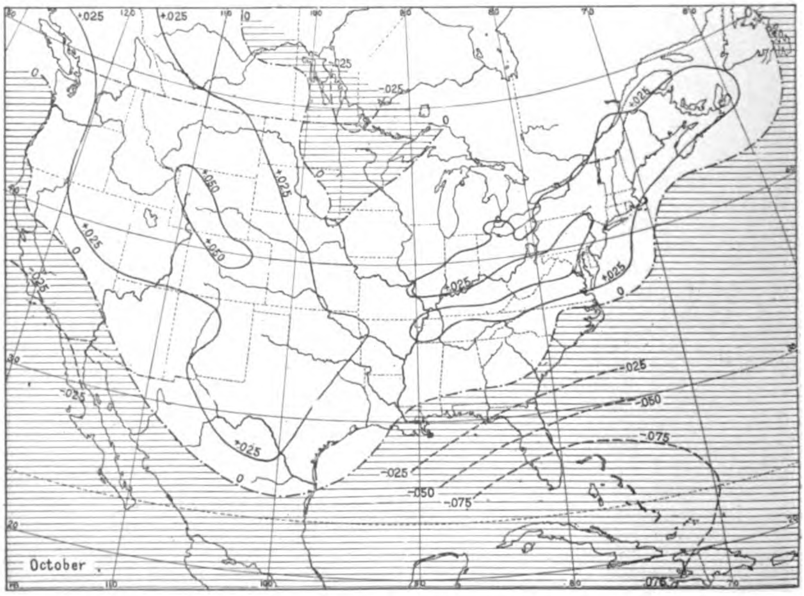

Fig. 11

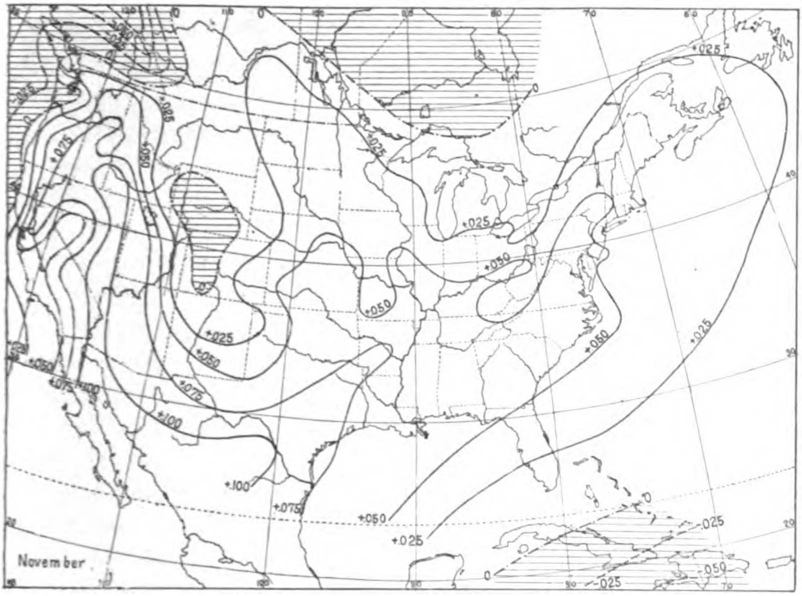
November
+.025
+.050
+.075
+.100
0
-.025
-.050

FIG. 12

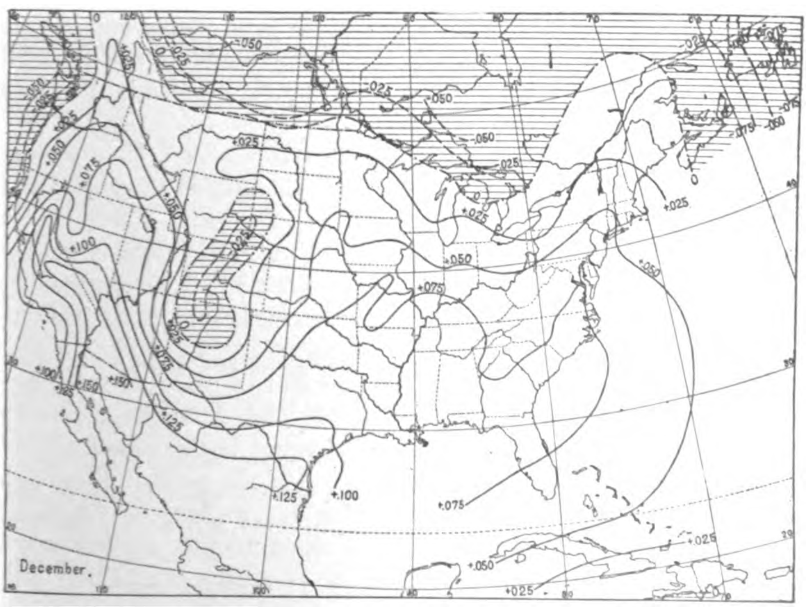
December
+.025
+.050
+.075
+.100
+.125
+.150
0
-.025
-.050

FIG. 13

Porto Rico. Therefore it is a wave movement to and fro, a seasonal migration.

In order to study this migration I have drawn maps of the departures of the mean monthly means from the normal atmospheric pressure (Figs. 2 to 13). On the maps the equi-departure lines are drawn for every 0.025 of an inch. The positive areas indicate the excess of pressure above the normal annual mean and the shaded negative areas the deficit below the normal. These maps represent therefore the real transport of the air masses quantitatively.

The comparison of the maps naturally leads to many remarks. I will mention but a few points which are of more general interest.

As I pointed out before, the minimum of the yearly variation occurs in January at the summit of Pike's Peak. At the stations of the plateau region where the annual minimum occurs earliest it is only in March that we observe it. Now why is this so? The maps explain the fact. In January, when the temperature is lowest, the area of negative values at the plateau stations is due, exactly as at the summit of Pike's Peak, to the greater density of the air: in other words the air has to flow down the slopes in order to be maintained in equilibrium, while on both sides, east and west, the pressure is much above the normal. In February the pressure decreases and in March it is below the normal. The base on which the layers of air repose on the plateau has gone down, and the decrease of pressure below causes the March minimum above. In reality the minimum occurs in January; it is retarded till March mechanically.

Now, why does the yearly minimum migrate as I have shown? The maps will give us an answer. From the maps I have prepared cross-sections along a straight line from Sault Ste. Marie to San Luis Obispo. The following diagram (Fig. 14) gives the sections for the months from January to June. First of all we see that the difference between the depression and the ridges is greatest in January and diminishes until May. We also see at once why it is that the lowest value is observed in March. But in place of the occurrence of this minimum we notice in May and June the formation and development of a maximum. Referring to the maps we find that this maximum occurs in August. On the section there is a shifting of the minimum in April. In May we have two minima. In June the growing maximum shifts these minima farther apart, one to the northeast and the other to the southwest. The March minimum of the plateaus, which is a mechanically retarded January mountain minimum, has therefore a marked influence on the

occurrence of the annual minimum in the surrounding region. The minimum has to migrate; the maximum also. The sections for the months from August to December (not published here) show this very well.

The maps measured with a planimeter could serve to estimate the quantities of air which are displaced one way or another month by month. At least one figure is of great general interest. It is the figure expressing the weight of the total mass of air going from and coming back over the area of the United States, the difference between the mean values of the months of highest and lowest atmospheric pressure.

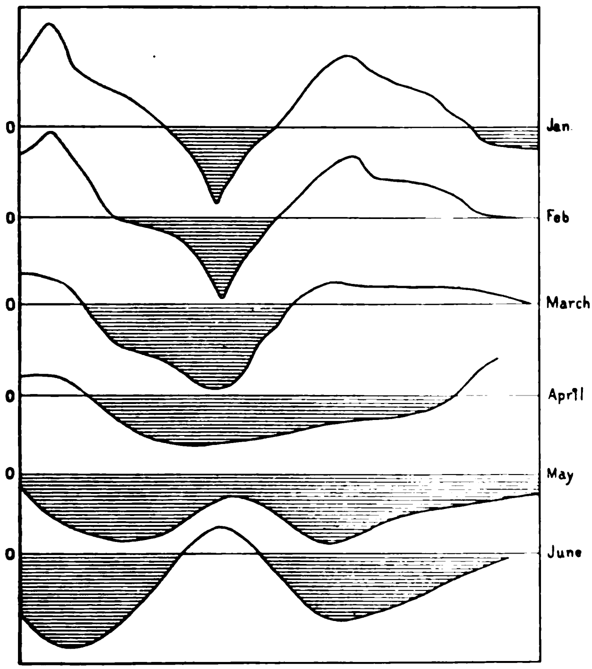

FIG. 14—Cross-sections along a line from Sault Ste. Marie, Mich., to San Luis Obispo, Cal., showing the mean monthly departures from the normal atmospheric pressure (indicated by the 0 line) from January to June. Based on Figs. 2 to 7.

As planimetric measurements require more time than I can afford on this particular question—which interests me but indirectly—I have simply taken the figures from Table 54 in Bigelow's report. Bigelow calculated the mean departures of the ten groups of stations and then computed the means. The extreme means are +0.045, in December, and —0.044, in May. The differ-

ence in the pressure over the United States between May and December is therefore 0.089. This figure is too small inasmuch as Bigelow's groups of stations cover unequal areas. Nevertheless let us imagine a difference of 0.090 inches (or 2.3 mm.) of mercury. The weight of one cubic centimeter of mercury being 13.5956 gr.,[6] the weight of a column 2.3 mm. high is 3.126988 gr. per square centimeter. In other words the difference in atmospheric pressure between the months of December and May is equivalent to the weight of a column of water at least 3 centimeters high. This amounts to 30,000 (metric) tons per square kilometer or 235,181,490,000 tons for the surface area of the United States.[7]

It is this weight of air (equivalent to the weight of 235 cubic kilometers of water) which periodically moves away and comes back. The maps show the details of the displacements.

Let us consider the monthly distribution of pressure along the 90th meridian. The cross-sections for the months from August to December show that the high pressure area moves from north to south. In August pressure is above the normal on Lake Superior; in September the crest of the positive wave is near Dubuque, in October it is over St. Louis, in November at Memphis and in December at New Orleans. From August to December the positive departures at the crest increase and at the same time cover a progressively wider area. The surplus of air which makes this wave comes, as the maps show very well, from the northeast and the southwest. There is a double movement of the air masses: the air necessary to increase the pressure comes first from the northeast, the Atlantic, then from the southwest, the Pacific Ocean west of Mexico, and this is probably the reason why the crest has to move from north to south along the 90th meridian.

There are many minor phenomena of this same kind for which a careful study gives an easy explanation. Studied from another point of view, especially in connection with the data on wind and rainfall, I think the maps would give information relating to the study of crops. The data I utilized to draw the maps were averages. In the case of particular years the departures may be very different from what they are on the average.

In these Studies on Climate and Crops I will have to come back to the investigation of the annual variation of atmospheric pressure and examine the subject from the point of view of abnormal con-

6 Smithsonian Geographical Tables, 1906.

7 According to the Statistical Abstract the surface area of the United States is 3,026,789 square miles.

ditions existing in particular years. As an example I will cite the differences of the mean yearly pressures observed at Cheyenne and San Francisco. The smallest figures are those of 1878 and 1889, years of minima of sunspots. The largest difference occurs in 1893, a year of maximum of sunspots. One may ask in what particulars the annual variation of atmospheric pressure in 1893 was different from the average.

As we have seen, the annual ebb and flow of the atmosphere over the North American continent is a phenomenon far less complicated than it seemed to be. We may hope therefore that it will not be too difficult to discern the superposition of abnormal waves, due to the variations of solar activity, upon the normal waves due to the changes of the seasons.

DOBBS FERRY, N. Y., June 23, 1912.

SCOTT'S LAST EXPEDITION: A REVIEW*

By WILLIAM HERBERT HOBBS

Eight years ago, after the return of Scott's first expedition, appeared "The Voyage of the 'Discovery'" in two large volumes. This was followed in 1910 by the report of the British expedition under Lieut., now Sir Ernest Shackleton, likewise in two volumes of similar size entitled "The Heart of the Antarctic." The two new volumes which describe Scott's second and last expedition maintain the form and the general external appearance of their predecessors, though surpassing them—as they do, indeed, all other reports of similar purpose—in the perfection and the beauty of their illustrations.

Taken together these six volumes of narrative and scientific observation are without a rival and should be the cause of just pride for every compatriot of the great leaders, Scott and Shackleton.

*Scott's Last Expedition: Vol. I Being the Journals of Captain R. F. Scott (xxiv and 446 pp); Vol. II Being the Reports of the Journeys and the Scientific Work Undertaken by Dr. E. A. Wilson and the Surviving Members of the Expedition (xvi and 376 pp.) Maps, ills, index. Arranged by Leonard Huxley with a preface by Sir Clements R. Markham. Dodd, Mead & Co., New York, 1913. $10.00. 9½ x 6½.

The heroic endeavors and the tragic fate of Scott and his companions, Wilson, Oates, Bowers and Evans, are already known to everyone; and the full story of their fateful polar journey was awaited as has been no other report in the long history of exploration. In advance of the appearance of the work in English, the rights of translation of this story were secured for a great number of foreign languages.

Volume I, which is devoted exclusively to the diary of Captain Scott, has wisely been left by the editor with little change, even though the parts which precede the eventful polar journey are somewhat diffuse and would probably have been considerably revised by their author before publication. The diary of the polar journey confirms, it must be frankly admitted, the impression that the expedition was not only peculiarly marked by untoward circumstances, such as the unusually inclement summer and the early break of the succeeding winter, but quite as much by a persistent belief, in the face of much evidence to the contrary, that ponies are superior to dogs as traction animals on polar journeys. Whatever may have been the views in the past, the comparative logs of the Amundsen and Scott polar journeys, having all due regard to differences in weather conditions encountered, have definitely settled this question. How the English polar party met each succeeding reverse without complaint, and how they struggled on to their almost certain fate, is told in the simple and modest language of a truly great man and explorer. The wresting from them of the prize for which they had struggled took the heart out of the party and must have meant a distinct loss of speed upon the homeward journey. It is much more than probable that this disheartenment lost them at least the eleven miles which were necessary to reach the One Ton Depot in advance of the great blizzard which finally wrecked the expedition. A few lines from the diary tell the story:

"Jan. 16 . . . . The worst has happened; or nearly the worst. We marched well in the morning and covered 7½ miles. Noon sight showed us in Lat. 89° 42′ S., and we started off in high spirits in the afternoon, feeling that tomorrow would see us at our destination. About the second hour of the March Bowers' sharp eyes detected what we thought was a cairn; he was uneasy about it, but argued that it must be a sastrugus. Half an hour later he detected a black speck ahead. Soon we knew that this could not be a natural snow feature. We marched on, found that it was a black flag tied to a sledge bearer; nearby the remains of a camp; sledge tracks and ski tracks going and coming and the clear trace of dogs' paws—

many dogs. This told us the whole story. The Norwegians had forestalled us and are first at the Pole. It is a terrible disappointment, and I am very sorry for my loyal companions. Many thoughts come and much discussion have we had. Tomorrow we must march on to the Pole and then hasten home with all the speed we can compass. All the day dreams must go; it will be a wearisome return" (pp. 373-374).

Nowhere in the diary is there a suggestion that the "butting in" of the Norwegians at the last moment upon territory which the unwritten traditions of exploration had preempted for the British expedition until their attempt had been made, was other than entirely sportsmanlike. Whatever their feelings, the members of the expedition, and the British nation as well, have maintained a most discreet and praiseworthy attitude.

Scott's diary indicates that he was apprehensive lest the cairns and depots which had been set up along the course might be missed upon the return; and the difficulties encountered during the earlier stages served only to increase his anxiety. The remarkably keen vision of Lieut. Bowers more than once saved the party, sometimes after the cairn had been passed. Amundsen's more elaborate precautions of setting up transverse series of snow cairns at frequent intervals along the route would thus appear to be necessary to insure safety on such journeys over a featureless plain subject to violent storms.

The death of Captain Scott having left us with no summary report upon the polar journey, we must perforce cull the isolated scientific observations from his narrative of toil and hardship, and the greatest interest naturally centers upon the vicinity of the pole which has only once before been entered. Amundsen's sojourn south of lat. 89° S. had indicated it to be an area of light and variable winds and generally good weather, in contrast to the strong southerly winds which descend the ice slope toward the margins of the plateau area. It is thus interesting to find that Scott's observations made about a month later led him to similar and independent conclusions. He reports that the sky in the near-polar region was often overcast, and that the clouds "don't seem to come from anywhere, form and disperse without visible reason. The meteorological conditions seem to point to an area of variable light winds." During much of the time fine snow crystals were falling but with the sun not obscured. The fallen snow is not compacted, but is soft "as deep as you like to dig down." A similar observation to this was made by Amundsen. Farther out

toward the margin of the inland ice the earlier observations have indicated a distinct stratification of the snow with thin hard crusts separating thicker layers of soft material.

Upon the return journey a halt was made to examine the mountain rampart at the upper end of the Beardmore Glacier outlet, and specimens of coal containing distinct plant impressions were secured from the Beacon sandstone formation. At the special request of Dr. Wilson, these specimens were not abandoned even when every pound of burden caused delay in what became a race for life against cold and starvation. These fossils should fix the geological age of the great sandstone formation of the region, but as yet they have not been reported upon.

Volume II includes reports upon various sub-expeditions, beginning with that of Wilson, Bowers and Cherry-Garrard made in the midst of winter to the penguin rookery at Cape Crozier, in order to secure eggs during the breeding season and, upon embryological grounds, to learn the relationship of the emperor penguins. In view of the severe weather encountered this was one of the hardest sledging journeys upon record. It lasted for five weeks and for much of the time air temperatures were below —50° F. with a minimum of —77° F. There follows the report of Lieut. Campbell upon the Northern Expedition which wintered at Cape Adare, and, unexpectedly, owing to a failure of the *Terra Nova* to take off the party, a second winter was passed in an igloo near the foot of the Reeves Glacier on the western shore of the Ross Sea. The party suffered great hardships, being compelled to subsist in their snow cave upon seal and penguin for the most part. In the spring they rescued themselves by a sledge journey across the sea ice to headquarters at Cape Evans.

Two expeditions to the westward of McMurdo Sound and Ross Sea were made under the direction of Mr. Griffith Taylor, the chief geologist of the expedition; by the use of theodolite and plane table an excellent map was prepared to replace the reconnaissance map made by Ferrar of the earlier Scott expedition. This map is undoubtedly the most accurate and satisfactory of any that has yet been prepared in the Antarctic. A number of new glaciers are described, and valuable glaciological and physiographical data were secured and are discussed by Taylor and Debenham in special sections of the volume. Special studies of ice physics were made by Wright, and extended meteorological data were collected by Simpson. A summary of biological work carried out on board the *Terra Nova* is supplied by Lillie.

Dr. Simpson, the meteorologist of the expedition, upon the basis of his observations has reached the conclusion that the blizzards which are so severe at Cape Evans and along the route of the polar party, are local and restricted to the western margin of the Great Ross Barrier. His explanation, sketched in outline only, is that the refrigeration of the air by the Ross Barrier produces an area of high pressure above it, and that this air tending to flow northward toward the area of lower pressure lying over the Ross Sea, is deflected westward in consequence of earth rotation and so made to pass northward over McMurdo Sound where it meets the mountain ranges in Victoria Land. In the opinion of the reviewer this theory fails to take account of the severe blizzards encountered by the Shackleton party (and by the Scott party as well) upon the ice plateau, the proven centrifugal distribution of winds about this plateau, and the change of wind direction at the British winter stations during the progress of a blizzard.

In conclusion one is tempted to mention again the exceptional beauty of the illustrations in these two volumes, largely to be ascribed to the remarkable skill of Mr. Herbert G. Ponting, the photographer of the expedition.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

The Society's Exhibitions. Public interest in the exhibitions at the Society's house give ample encouragement to continue this feature of our work. The attendance during the first ten weeks of this year was 2,817 and would doubtless have been much larger if it had not been for the long period of inclement weather. On March 15, the first pleasant Sunday in six weeks, there were nearly 500 visitors. The exhibition has recently consisted of many views of conspicuous types of the vegetation of the world published by Gustav Fischer, Jena, a series of large views showing types of the physical forms of the earth, and a collection of superior etchings, presented to the Society by Vice-President Anton A. Raven, illustrating historic public buildings, houses and scenes in the early days of our history as a nation. A part of the space in the exhibition hall is given to maps relating to the Spanish and Portuguese lands in the new and old world simultaneously with the exhibition, at the Hispanic Society of America, of photographs, books, etc., covering the same regions.

The exhibition in our house will be suspended on Friday and Saturday, April 3 and 4, as the room will be needed for the meeting of the Association of American Geographers.

Meetings of the Society. A regular meeting of the Society was held at the Engineering Societies' Building, No. 29 West 39th Street, on Tuesday evening, February 24, 1914; Vice-President Greenough in the chair. The following persons, 22 in number, recommended by the Council, were elected to Fellowship:

David Gibbs, Meriden, Conn.,
Edward Cummings Hartshorne, Englewood, N. J.,
Miss Mary A. Armour, Kansas City, Mo.,
John Russell Clarke, Elmira, N. Y.,
Benjamin G. Brawley, Atlanta, Ga.,
Miss Juliette A. Owen, St. Joseph, Mo.,
Lucius F. Donohoe, Bayonne, N. J.,
Roland B. Dixon, Cambridge, Mass.,
Alfred J. Henry, Washington, D. C.,
James F. Chamberlain, Pasadena, Cal.,
Otto Holstein, Guayaquil, Ecuador;
and, of this city:
William Harmon Black,
Gutzon Borglum,
Mortimer N. Buckner,
Henry Kelly Brent,
Frederic Coerr,
Stuart Crockett,
Burdett P. Craig,
Miss Katherine L. Cammann,
Mrs. Sophia Klein,
Jerome Kingsbury,
Max Mayer.

Mr. James W. Erwin of San Francisco then addressed the Society on "Hawaii: Our Mid-Pacific Outpost." Besides many lantern illustrations the lecturer showed a considerable number of very effective moving pictures.

A special inter-monthly meeting was held on Thursday evening, March 12, 1914, when Mrs. Henshaw, Honorary Secretary of the Canadian Alpine Club, gave a lecture upon "A New Alpine Area in British Columbia," illustrated by lantern views.

NORTH AMERICA

The Trend of Geographical Study in Our Country. Professor Isaiah Bowman read a paper at the meeting of the Association of American Geographers in Princeton last winter on the topics dealt with in the papers read before the Association between its first meeting in 1904 and its last meeting three months ago. He said that the first meetings (1904-1906) were

naturally marked by a large number of physiographic papers. Then came a period (1907-1910) when physiography and anthropogeography were alternately ahead. In the last three programmes previous to the latest meeting, anthropogeography led, owing chiefly to the growing number of students devoted to the life side of the science. At the Princeton meeting an increasingly large proportion of the total papers dealt with various phases of human geography. Future programmes will probably show a still stronger tendency in this direction, judging by the animated discussions evoked by the more strictly geographical papers.

Flood Sufferers. Destitute refugees to the number of 272,752, and 54,525 head of live stock were cared for during the Mississippi floods of April-July, 1912, according to the report of Major J. E. Normoyle (Flood Sufferers in the Mississippi and Ohio Valleys, *Doc. No. 1,453, House of Repr., 62d Congress, 3d Session,* Washington, 1913). The relief cost the Government about $1,000,000. The report details the daily events during the great flood and gives a good idea of the distress caused by the breaking of the levees. It is similar in style to many Government reports, however, which means that the only way to get information from it is by patient plodding through innumerable telegrams, many of which are of no value whatever.

ROBERT M. BROWN.

Lightning and Forest Fires in the United States. Foresters and meteorologists are indebted to the late Fred G. Plummer, Geographer of the Forest Service, for his excellent and thorough study of "Lightning in Relation to Forest Fires" (*Forest Service Bulletin III,* 1912, pp. 39). The part played by lightning in causing forest fires has lately come to be recognized as of great importance. Observations in our National Forests show that it ranks second only to sparks from locomotives as a source of conflagration. Mr. Plummer collected and sorted all existing data relating to lightning and trees. He secured observations from our National Forests and carried on laboratory experiments. Observations of the number of fires caused by lightning in the United States, the kinds of trees most often struck, and the proportion of those struck which ignite have been made by nearly 3,000 forest officers over a territory of nearly 200,000,000 acres. The general conclusions reached by Mr. Plummer were:

1. Trees are the objects most often struck by lightning because: (*a*) They are the most numerous of all objects; (*b*) as a part of the ground they extend upward and shorten the distance to a cloud; (*c*) their spreading branches in the air and spreading roots in the ground present the ideal form for conducting an electrical discharge to the earth.
2. Any kind of tree is likely to be struck by lightning.
3. The greatest number struck in any locality will be of the dominant species.
4. The likelihood of a tree being struck by lightning is increased: (*a*) If it is taller than surrounding trees; (*b*) if it is isolated; (*c*) if it is upon high ground; (*d*) if it is well (deeply) rooted; (*e*) if it is the best conductor at the moment of flash; that is, if temporary conditions, such as being wet by rain, transform it for the time from a poor conductor to a good one.
5. Lightning may bring about a forest fire by igniting the tree itself, or the humus at its base. Most forest fires caused by lightning probably start at the humus.

R. DEC. WARD.

Oil Production of Mexico. Mexico now holds third place in the list of oil-producing countries. Its annual output amounts to about 18,000,000 barrels, and is exceeded only by that of the United States and Russia. The exports for 1913 will probably amount to 17,000,000 barrels (*Daily Consular and Trade Reports,* Oct. 11, 1913). Mexican oil is much used for fuel purposes. At Manchester, England, tanks for the storage of over 8,500,000 gallons of Mexican oil have been provided. The liquid fuel is distributed by tank cars to plants in Lancashire, Cheshire and the Midland counties. It is also sold to oil-burning vessels. During 1913 a considerable quantity was delivered at

Batum for the account of the Transcaucasian State Railways Company. The Mexican oil fields extend along the entire Atlantic coast. They have been best developed near Tampico and Coatzacoalcos. LEON DOMINIAN.

SOUTH AMERICA

Determining Longitudes by Wireless Telegraphy. Commander H. A. Edwards of the Bolivian section of the Brazil-Bolivia Boundary Survey wrote from the river Abuna, Bolivia, on Nov. 25, that it had been found possible to carry longitude by means of wireless telegraphy right into the heart of the Amazonian forests. Time signals have repeatedly been received from Mr. Atkinson at Porto Velho, the starting point of the Madeira-Mamore R.R. Between Porto Velho and the stations on the Rios Rapirran and Abuna there is no break in the Amazonian forests, but the signals were perfectly receivable in small clearings. Other signals were heard from Lima to Iquitos. The application of wireless telegraphy to expeditions for exploratory surveys opens up visions of new possibilities in which chronometers are relegated to a place of secondary importance. (Condensed from *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 206-207.)

AFRICA

Completion of the Tanganyika Railroad. It was officially announced from Berlin on Feb. 2 that the railroad across German East Africa from Dar-es-Salam to Lake Tanganyika was completed Feb. 1 when the rails were laid down at the western terminus, Kigoma, a few miles north of Ujiji. The railroad is 777 miles long and is likely to have important influence not only upon the development of the German colony but also upon the economic future of the Belgian Congo and of Central Africa generally. Express trains will now be able to reach the coast from the lake in two days as compared with the 42 days' journey of the caravans. An important proportion of the Central African trade is bound to gravitate to Dar-es-Salam.

Union of Northern and Southern Nigeria. On January 1 the former colonies of Northern and Southern Nigeria were united under one administration with Sir Frederick Lugard as the first Governor-General. The estimated population of the whole territory is about 17,000,000.

ASIA

Volcanic Eruption in Japan. A terrific eruption of the volcano of Sakura Shima occurred on January 12. This volcano stands on an island in the Gulf of Kagoshima, an indentation on the south coast of Kiushiu, the southernmost of the large islands of Japan. The eruption was preceded for two or three days by sixty or seventy earthquake shocks. Columns of smoke and flame burst from many parts of the mountainside enveloping the whole island. Lava streams pouring down the slope overwhelmed many villages, and great blocks of stone were shot out of the crater to an estimated height of over 2,700 feet, some falling twenty miles away. The heat of the eruption was intense at the city of Kagoshima, about ten miles west of the volcano on the mainland. The city was set on fire and all the inhabitants fled northward. Many lives were lost, especially in the villages on the little island where the volcano stands; and many hundreds of houses were destroyed by the earthquake shocks which were felt all over Kiushiu. There was a heavy fall of ashes in Nagasaki, about 100 miles to the northwest, and ashes also fell as far away as Osaka and Ogasawara. The number of deaths, at first exaggerated, is not believed to have been over 600 persons.

Cold Weather Storms of Northern India. The cold-weather storms of northern India occur between December and April, and are of considerable agricultural importance. It is, therefore, extremely desirable that their origin should be ascertained. The view that these disturbances are generated

over the arid districts of Persia and Beluchistan presents several difficulties. Charts recently prepared by Mr. J. I. Craig, of the Meteorological Service of Egypt, for the years 1906-1912, show that about seven-tenths of the disturbances which affect northwestern India in those months are continuations of depressions from southern Europe, but the paths of the depressions vary considerably from year to year. If these storms pass over Syria or Asia Minor, it is to be expected that severe winters with much precipitation in these areas will tend also to be severe winters in northwestern India. The seasonal rainfall in northwestern India was compared with that of places to the west. The evidence shows that the winter seasons in the west of Asia Minor, in Syria, and in Malta, have a closer resemblance to those of northwestern India than do the winter seasons of Persia and Mesopotamia. (*Memoirs Indian Met. Dept.*, Vol. XXI, Part 7.) R. DEC. WARD.

AUSTRALASIA AND OCEANIA

Australian Wheat Farming. The Commonwealth Meteorologist announced in February that Australia's prosperity for the last ten years had been due not to exceptionally good rainfall but to better understanding of the climatic problem, to better systems of farming and to the vast cereal areas that could now be utilized by artificial fertilization. He estimates that 500,000 square miles have been rendered suitable for wheat growing by the new methods.

Mineral Resources of Papua. The *Bulletin of the Territory of Papua* (1913) has reports showing that natural gas, oil, coal and copper are found in the Territory. A gas and oil belt covers about 200 square miles between the Vailala and Purari Rivers and the coast. It is surmised that this district is the prolongation of the oil-fields of the Malayan archipelago. Lignite has been found west of the Purari River between the coast and the valleys of the Samia and Piau Rivers. Copper is reported from the Astrolabe Range in the valley of the Laloki River about ten miles northeast of Port Moresby. Development work has been marked by production and exportation of ore in small quantities.

EUROPE

Geographical Causes of Italian Emigration. A significant paper by Dr. Alfred Rühl on the "Geographical Causes of Italian Emigration" appeared in the *Zeitschr. der Gesell. für Erdkunde zu Berlin*, 1912, pp. 655-671. The occasion for Dr. Rühl's writing lies in the campaign for the conquest of Tripoli. Referring to a common impression that the Italian Government has been guilty of national piracy, the author proceeds, upon geographical grounds, to pass a milder judgment. The more because France, by its occupation of Morocco, strengthens its position in the west, does Italy, in its central position and with its large population, follow a certain call to become the dominant power in the Mediterranean region. The march to Tripoli is not properly a symptom of an Italian imperialistic policy, but is due to more weighty considerations. Emigration from Italy has become so truly calamitous as to raise a vital question for the future of the nation. To the solving of the problem a parliamentary commission has devoted much attention and has made an extended report upon the conditions of living in the southern provinces.

In the decennium 1896-1905 emigration from Italy reached the enormous figure of 4,322,425. Tripoli is for Italy the only available region at once near at hand similar to Italy in physical conditions and offering an economic future. Dr. Rühl declines to make any pronouncement upon the wisdom or final good of the movement, but shows from substantial data that it was not sensational or irrational.

The loss of population is not from the large cities but from the rural regions. This loss is grounded upon a number of serious limitations found in the physical conditions of the Italian peninsula, and it is here that the geographical phases of the problem specially appear. The land is mountainous, the alluvial plains of the Po being the only important exception. Terrace culture is toil-

some and costly, and even in Italy the climate at the higher altitudes is harsh. Everywhere the higher lands show much the greater percentages of emigration. A further restriction of utility is found in the malaria, the scourge of some lowlands whose conditions are otherwise good. Here also the percentage of emigration is high. A further condition is found in the incapacity of the chalk formations of the Abruzzi and other mountain districts to retain sufficient water for culture. The barrenness of some regions of granite and schist narrows the power of other southern highlands to support a population. The instability of some slopes and the frequency of landslips form another handicap.

Difficult also are the making and maintenance of means of transportation. This arises from the youth and ruggedness of the land surfaces, the heavy grades to be surmounted and the great number of costly tunnels and other works that are necessary. The common roads also are in many districts of such a character as almost to prohibit the movement of products. Another result of geological youth is the great number and destructiveness of the earthquakes which the land experiences. Nor are the climatic conditions without serious consequences to agriculture. The rainfall, for example, while ample in amount, surpassing even that of middle Europe, has an unfavorable seasonal distribution, and evaporation is large, so that plant life is ill supplied and expensive irrigation is required. Deforestation adds its quota of disaster, and floods all too frequently devastate the valleys.

All these conditions contribute momentum to the movements of emigration. The author hints at the industrial, economic and social improvements which may relieve the difficulties of the national situation, but it is no part of his purpose to discuss matters of this nature. He does affirm, however, that agriculture must continue to lie at the foundation of Italian industry and prosperity. A. P. BRIGHAM.

The Amerika-Institut in Berlin. This institution is a most useful and welcome medium for the interchange of ideas between Germany and the United States. Founded a little more than three years ago, its work is carried on under the auspices of the Prussian Ministry of Education. It is housed in the Royal Library on Unter den Linden, where it has ample offices and has already gathered a serviceable American library of 11,000 volumes. The Director, Dr. Drechsler, and the Assistant Director, Dr. Berttling, have had ample educational experience in America and give unstinted cooperation both to Germans who are investigating American subjects and to Americans making longer or shorter residence in Berlin. Incidental to its main purpose the Institut assists German authors to obtain copyright in the United States and also cooperates with the Smithsonian Institution of Washington in the exchange of documents between Germany and the United States. The handling of more than 34,000 packages in the year 1912 shows the extent of this exchange.

A. P. BRIGHAM.

The Association of Students of Geography at the University of Leipzig. Under the name of "Verein der Geographen an der Universität Leipzig" a scientific association of students of geography has recently been organized at that university which, in addition to weekly meetings and frequent excursions, has begun the publication of scientific papers.[1] Founded by Dr. Lehmann in 1911 after the model of the similar association at the University of Vienna, it has become the center of activity among the younger men interested primarily in the scientific aspect of the subject, although teachers of geography in Saxony are joining the association in increasing numbers. The meetings with their discussions tend to clarify the point of view and broaden the knowledge of the members, while the great number of excursions teach observation in the field. Detailed reports on these excursions, prepared mainly by the younger students, afford their authors opportunity for

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[1] *Mitteilungen des Vereins der Geographen an der Universität Leipzig:* I (1911), II (1912), III (1913).

Eine geographische Studienreise durch das westliche Europa, von W. Hanns, A. Rühl, H. Spethmann, H. Waldbaur, mit einer Einleitung von W. M. Davis. Leipzig, 1913.

training in original geographical presentation, while the directions and information they contain make them helpful as guides for those who wish to undertake the same excursions by themselves. A large number of prominent university professors, German, Austrian and American, are patrons of the association. Its library, whose value has been increased through its exchanges, supplements the geographical libraries of the city. The present number of members is 156.
WALTER HANNS.

A Congress of Hispano-American Geography and History in Spain. A Congress of Hispano-American Geography and History will be held in Seville on April 11-17 to commemorate the fourth centenary of the discovery of the Pacific Ocean. Documents and maps relating to Spain's former American colonies will be exhibited. A considerable amount of unpublished material will be exhibited for the first time, such as the records of the Archivo de Indias, of the Archivos generales de Simancas, Alcalá é Histórico, etc.

POLAR

Sir Ernest Shackleton's Next Expedition. *The Geographical Journal* (Vol. 43, 1914, No. 2, pp. 173-178) prints Shackleton's plans for his coming Antarctic Expedition. He expects to sail from Buenos Aires early in October this year for Weddell Sea, south of the Atlantic, and will establish a winter camp on Prince Luitpold Land, the part of the Antarctic Continent discovered by Filchner in 1912. The second in command will be Frank Wild, a first-class surveyor who was with Scott in 1901-1904, with Shackleton in 1907-1909, and more recently made an important sledge journey along some hundreds of miles of the coast of Wilkes Land. At winter quarters Shackleton will leave a trained biologist, a geologist and a physicist for scientific work and will also provide a party of three to explore the wholly unknown land to the east of the camp.

His main purpose is to cross the South Polar continent from Weddell Sea, south of the Atlantic to Ross Sea. He intends to strike out for the South Pole, from which point he plans to take a route either to the eastward of Amundsen's track to the Pole or between the routes of Scott and Amundsen on their journeys to that region. His route will thus be entirely over new ground. His party of six men will undertake the trans-Antarctic journey with 120 dogs and two sledges. A ship will be provided to meet him at Ross Sea. He hopes to accomplish good results in the various branches of scientific work.

Stackhouse's Antarctic Expedition. Further details as to the organization of Mr. J. Foster Stackhouse's expedition supplement the information given in the *Bulletin* (February, 1914, p. 134). Arrangements are being made to leave London on Aug. 1 in Captain Scott's old ship, the *Discovery*. The officers and crew will number 25. The scientific staff will include Lord Congleton and two other experienced surveyors, all officers and scientists giving their services gratuitously. Lieut. A. E. Harbord, R.N., will command the *Discovery*. The expedition expects to be away for three or four years. It will endeavor to settle the question whether King Edward VII Land is a part of the Antarctic Continent or merely a small island, or group of islands; and also explore the coast of the Antarctic Continent between Graham Land in the east and King Edward VII Land in the west. Here is a large stretch of shore line and land forming a vast and practically unexplored region. (Condensed from *The Times*, Weekly Edition, Feb. 6, 1914, London.)

WORLD AND PARTS OF IT

Weather Map of the Northern Hemisphere. On January 1, the United States Weather Bureau began the publication at Washington of a weather map of the Northern Hemisphere. Hereafter this map will be printed on the reverse side of the morning weather map of the United States. A similar manuscript map of the Northern Hemisphere has been prepared daily

for several past years in the Weather Bureau, and has proved of great value to the forecasters in predicting general changes of the weather, and especially in extending the periods for which such forecasts can be successfully made. Although the number of reports available for the construction of the map is limited at present, and the times of observation are not all strictly simultaneous, still the essential features of the atmospheric circulation over the Northern Hemisphere are fairly well depicted.

It seemed advisable not to retain the arbitrary units ordinarily employed for measuring pressure and temperature of the atmosphere, but to adopt the more scientific and rational units of the C. G. S. system. Accordingly, the reported pressures are all expressed in dynamic units in which a pressure of 750.06 mm. of mercury corresponds to a force of 1,000,000 dynes. The reported temperatures have all been reduced to the absolute scale (Centigrade) on which the temperature of melting ice is 273°.

The Cruise of the "Carnegie." Mr. William J. Peters, Chief of the Carnegie Magnetic Expedition, under Dr. L. A. Bauer, director, sends us the following summary of the cruise around the world:

"The yacht *Carnegie*, belonging to the Carnegie Institution of Washington, finished her cruise around the world when she arrived at New York on December 20. Over 1,400 determinations of the magnetic elements were made at sea, distributed over some 92,000 miles. The ports of call were: Vieques (Porto Rico), Para, Rio de Janeiro, Buenos Aires, Cape Town, Colombo, Mauritius, Batavia, Manila, Suva, Papeete (Tahiti), Coronel, Port Stanley, St. Helena, Bahia and Falmouth. Two of these ports were visited twice, Colombo and St. Helena.

"Comparisons of the ship's absolute instruments and the instruments at magnetic observatories were made at Vieques, Pilar, Mauritius, Batavia and Manila, through the courtesies of the officers in charge. These comparisons afford the means of correlating the results of these observatories. The crossings and recrossings of the *Carnegie's* tracks and those of the *Galilee* and *Gauss* will afford valuable data for determining secular change on the oceans.

"The Director of the Department of Terrestrial Magnetism, under which the vessel is operated, Dr. L. A. Bauer, met the *Carnegie* at Colombo and Batavia, and sailed on the passage from Colombo to Mauritius and return. The *Carnegie* had remarkably good weather throughout the cruise until returning home, when she was caught in some of the stormy weather that generally prevails on the Atlantic seaboard in the winter months."

MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY

Present Status of Cartography. In their recently published "History of Geography" (Putnam's, 1913: in series "A History of the Sciences"), the authors, J. Scott Keltie and O. J. R. Howarth, have the following to say on the present status of cartography, in which the single sentence (italicized below) so aptly characterizing the development of this branch of geography in our country will be read with interest (Chapter XIV, pp. 171-173):

"The work of the cartographer, as exemplified in atlases and small-scale maps of general utility, has by no means in all cases followed the high standard of the surveyor. Commercial considerations are not to be overlooked; cheap and rapid methods of reproduction bring their temptations as well as their advantages to bear upon cartography. Their advantages are manifest; the map, whether as an adjunct to travel or as a graphic illustration of a great variety of subjects, has become a commodity of almost daily use. *But in some countries, such as the United States, the standard of cartography generally is as low as that of the maps of the survey is high.* The reduction and selection of details from a large-scale survey for use on a small general map, the methods of representing such details, the permissible limit of generalizing them, the choice of colors—these and other aspects of cartography really demand a scientific standard as exalted in its way as that of the surveyor. That standard has been most firmly upheld in Germany, in such geographical estab-

lishments as that founded by Justus Perthes at Gotha in 1785, which publishes the famous general atlas originally formed by A. Stieler in 1817-32, the physical atlas of H. Berghaus (1838-42), and many other such works. Other names of individual workers in the same field come readily to the mind—H. Kiepert, A. Petermann, K. von Spruner, Behm, Supan, Langhans, Andree, Debes, A. Ravenstein. The British and French lists are shorter, though the names of John Bartholomew, W. and A. K. Johnston, Edward Stanford and George Philip, Vivien de Saint Martin, F. Schrader and Vidal de la Blache must be remembered.''

The International Map of the World in 1:1,000,000. Some twelve sheets of this map have been produced in the four years since the First International Map Conference met in London. The work thus far done has demonstrated the desirability of making certain changes in the plan of production agreed to in London. The French Government therefore issued invitations to the other governments interested in the project to attend a second International Conference at Paris, which opened on December 10. Among the delegates present at Paris were Messrs. Penck, Partsch, Brückner, Loczy, Vidal de la Blache, Lallemand, General Schokalsky and Colonel Close. General Bourgeois was in the presidential chair.

It was decided to retain the arrangement of sheets, the projection, scales and unit of heights as agreed upon in London. The subjects of the Paris conference were therefore confined to conventional signs, representation of relief and the principles of the partition of the work.

It soon became evident that no binding decision was possible as to the classification of towns. For example, a town of 20,000 people has very different importance in Europe and in Africa. It was therefore left to the country producing the sheet to classify its towns for itself with the proviso only that the legends on the sheet margin shall explain the system adopted.

The double red line for roads was abolished. The solid line adopted will be more legible on the layer tints. Railroads, telegraphs, navigable rivers and canals were all dealt with and their signs revised in the light of experience. The conventional signs sheet, when issued, will give a better idea of these signs than any verbal description. The conference adopted ''Carte internationale du monde au millionième'' as the official name of the map.

The color scheme for layers was revised and new rules for contours adopted. Certain contours were made obligatory: 200, 500, 1,000, 1,500 meters, and so on; the 100 meter contour is defined as extremely desirable and the insertion or omission of the remainder is left to discretion, subject always to the provision that in principle the interval is still 100 meters. A similar convention governs the contours on the sea bottom.

The color scale decided upon is not very different from the old one up to 1,000 meters, but above that elevation it runs into shades of pure carmine in place of the brown turning to magenta. Layer colors will cease at the line of permanent snow and on the glaciers. The latter will be distinguished from snow-clad spurs by blue glacier lines and by a special bluish shade where necessary. Where the relief of the permanent snows is not sufficiently shown by contours, shade may be added to them at discretion. In fact, each map producing establishment has liberty to do the best it can, which is the only way towards a real solution of the problem. The color scheme for the sea was taken from the oceanographical atlas of the Prince of Monaco.

The preparation of sheets covering the territory of several powers equally capable of undertaking the work must necessarily lead to an exchange of views. A sheet extending from the territory of one such power to that of another with inferior cartographical resources falls naturally to the former. But in some parts of the world, particularly in Asia, there are whole sheets not provided for by this rule which may yet come within the scope of one or perhaps more than one power. In such cases the conference declines to lay down any rule.

The conference was much pleased when the delegate of the Chinese Republic announced that he was authorized by his Government to say that the General Staff at Peking has established in all the provinces of China cartographical

plants charged with the production of the map, and these operations are making steady progress.

Undefined boundaries in South America were settled for map-making purposes in a friendly conference between the representatives concerned, and the partition of Africa was agreed upon in principle.

The British delegation was authorized by their Government to propose that a permanent central office should be established in England with headquarters at the Ordnance Survey, and an auxiliary office in London. The office will have no executive authority and its function will be the publication of an annual report, the exchange of information, and the provision of useful data to all interested. The conference, with appreciative acknowledgments, accepted the proposal. (Condensed from the *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 178-182.)

GENERAL

Climate and the Protein Content of Wheat. Some interesting relations between climate and the protein content of wheat are given by Mr. G. W. Shaw in "The University of California Publications in Agricultural Sciences" (Vol. 1, No. 5). These investigations grew out of the fact that the millers of California found it necessary to import many hundred tons of wheat to maintain the quality of flour owing to the low gluten content of the local wheat. The crop tests showed marked variations in gluten in proportion to changes in precipitation, temperature and sunshine of the growing seasons; also that the higher gluten content came with a somewhat lower rainfall during the growing season. In order to test the influence of sunshine the plats were shaded with lath screens so as to cut off varying amounts of sunshine while portions were allowed to have maximum sunshine. The results showed that the optimum sunshine is slightly less than the normal amount for the valleys of the state. Portions of plats were cooled by shading during the morning hours and were further cooled by ice. The general effect of reducing the temperature was to increase the gluten content. F. V. EMERSON.

OBITUARY

SIR DAVID GILL. Sir David Gill, the distinguished astronomer, died at his residence in London on January 23 in his 71st year. His scientific fame rests chiefly on his skillful pioneer work in determining the distances of the heavenly bodies. The first successful attempt to measure the distance of a fixed star had been made a few years before he was born, but further progress was very slow until Gill threw his energies into the work. Our knowledge in this direction is still in its infancy and, in his Presidential address to the British Association in 1907, Gill did not venture to say more than that "accurate and minute measurement has given us some certain knowledge as to the distance of the stars within a certain limited portion of space"; that he could say even so much was largely due to his own work and to that which it stimulated in others.

EDOUARD JANSSENS. The Society learns with regret of the death of M. Edouard Janssens, President of the Royal Geographical Society of Antwerp, on Feb. 25, 1914, at the age of 50 years.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch)

NORTH AMERICA

he Indian Place Names on Long Island and Islands Adjacent with their probable Significations. By William W. Tooker. Edited, with an Introduction by A. G. Chamberlain. Published for the John Jermain Memorial Library, Sag Harbor, N. Y. xxviii and 314 pp. G. P. Putnam's Sons, New York, 1911. 9 x 6.

The author and the editor of this book deprecate the loss to our language so many Indian names. Most people in localities where the natural feares, as rivers, bays and hills, have retained names of Indian origin will adily agree that there is something distinctive and desirable in retaining ese reminders of the early inhabitants of the land. It is suggested that names recorded in the book be adopted to designate estates, camps, hotels, ttages and even vessels of all kinds, and to this end in Appendix I the thor has arranged a suitable list of names for this purpose. The bulk of book is given over to an alphabetically arranged list of names, mostly of gonquin origin. In each case as extensive a statement as could be made of origin, use and variations is included, so that the book forms an excellent erence book for the philologist and to some degree for the historian and the thropologist. ROBERT M. BROWN.

rly Days on the Yukon. The Story of Its Gold Finds. By William Ogilvie. xii and 306 pp. Ills. Thorburn & Abbott, Ottawa, 1913. 7½ x 5½.

Mr. Ogilvie died late in 1912, while still in the prime of life. Some years ore the Yukon Territory was organized he explored the Porcupine tributary the Yukon, this work first attracting attention to him. His intimate wledge of the peoples, geography and resources of the sub-Arctic and tic regions embraced in the Yukon Territory, especially adapted him for ting this history. His book is one that no other man could have written. deals most readably with many phases such as boundary matters, trading ts, gold discoveries and mining, discovery of the Klondike, experiences on Yukon, methods of mining, administration of law in the early camps, al customs, etc.; and Dr. Alfred Thompson in the Appendix has brought work down to date.

e Old Colonial System, 1660-1754. By George Louis Beer. Parts 1 and 2: The Establishment of the System, 1660-1688. Vol. 1: xvi and 381 pp. Vol. 2: vii and 382 pp. Index. The Macmillan Co., New York, 1912. $4 for 2 vols.

The value of the historical work of which these two volumes form the part lies in the story of English administration. This work will fill a gap veen earlier works by the same scholar. He has already dealt at length the origin of British dominions over seas as calling for a system of ropolitan administration, a period of experiment and intrigue which en-d in Whitehall and Westminster from 1578 to 1660. In like manner he presented the results of his study of the period in which the colonial cy of the mother country broke down through mismanagement, a period ly beginning in 1754 and ending in the insurrection of the American nies. The present volumes are designed to cover the intervening period, ninety years when the colonial system had attained a working plan and it was as well administered as it was possible for such a system to be

administered at long range and with far too little acquaintance with local conditions. Of the two volumes, covering a period of not quite a generation, the former is devoted to the metropolitan aspect of the question, the latter carries the metropolitan determination into the provincial field where it becomes essentially practical. The greater value of this series of studies is that the knowledge presented is essential to our better understanding of the American provinces at the time of our Revolution. Every school child knows glibly that if it had not been for the Stamp Tax and the Boston Tea Party there would have been no Lexington and no Yorktown. It is the object of these volumes to bring to our knowledge the things which galled our forefathers and brought them to the breaking point. Herein we shall see what economic and pocket grief was strong enough to create a band of patriots.

WILLIAM CHURCHILL.

Through Our Unknown Southwest. By Agnes C. Laut. 271 pp. Ills. McBride, Nast & Co., New York, 1913. $2.20. 8½ x 6.

The reviewer has traveled parts of our arid West in company with a great observer, keen to distinguish fact from fancy, and later had a line from his friend, dated west of the 100th meridian "The sky is still clear here!" Miss Laut calls it: "The morning air is pure wine. The hills are veiled in a lilac light—tones, half-tones, shades and subtle suggestions of subdued glory." Her language is exuberant, but it does rouse some sense of the western splendor, and exuberant language is called for. Yet it is not merely turgid language. She has a deep enthusiasm and real restraint. Her reader will long to see the Southwest away from the railroad and she opens charming vistas of inexpensive camping and ranching trips to Forest and Park.

Facts, it is true, she cares little for. Her goal is effects. She refers her antiquities lightly to dates 8,000 and 20,000 years B.C., calling one guess as good as another. Surely her ideas of the age and importance of the primitive civilization are utterly exaggerated. The pictures are admirable.

MARK JEFFERSON.

Our Southern Highlanders By Horace Kephart. 395 pp. Ills. Outing Publishing Co., New York, 1913. $2.50. 8½ x 6.

It was far from the purpose of the author to go very deeply into the demographic problems which cluster about this secluded society. His aim has been to interest by means of his intimate acquaintance with land and people. Yet the movement and character of these people are set forth somewhat more clearly than we recall in any former work upon the theme. The best characterization of the mountain community is that it has remained a frontier despite the advance of settled society beyond it, a frontier facing both ways and scarcely reconciled with a society of which it was the forerunner and by which it was unconsciously overtaken and outstripped.

The Geography and Industries of Wisconsin. By R. H. Whitbeck. 94 pp. *Bull. Wisconsin Geol. and Nat. Hist. Surv.*, No. 26. Madison, 1913.

This interesting bulletin is the third in the "Educational Series" of reports prepared by the Wisconsin Geological and Natural History Survey, and is intended primarily for use in the state schools. The industrial geography of the state is discussed under appropriate headings, and the method of treatment is such that the reader's attention is frequently directed to the geographical causes of the facts set forth. As a result the report is by no means a dry collection of statistics, but possesses more real interest for the average reader than the usual run of publications dealing with state industries.

The physical causes underlying the industrial growth of Wisconsin are briefly indicated in an introductory chapter, after which the mineral industries, forestry, agriculture, manufacturing and transportation receive more extended treatment. Numerous pictures, diagrams, and maps are effectively used, while tables of statistics are properly reduced to a minimum. A commendable feature is the concise summary placed at the end of each chapter. Occasionally the details of maps are illegible because of the quality of paper on which the text is printed. On the whole, the report is a creditable addition to the geographical literature concerning Wisconsin, and should prove of much value to the schools of the state. D. W. JOHNSON.

The Geography of California. By Harold W. Fairbanks. 190 pp. Map. Whitaker & Ray-Wiggin Co., San Francisco, 1912. 60 cents. 7½ x 5½.

The book discusses in Part I the various physical features of California, the natural resources, and the development of occupations. The lack of maps to show climatic conditions and distribution of life forms makes one wonder if the author has improved much upon the "inadequate manner" of other presentations of the geography of the state. Part II deals with the seven different natural regions of California. A reproduction of a photograph of a relief map shows the location of the provinces, but the more detailed discussion lacks illustration either by maps or photographs. The chapter on page 67 headed "Geographical Story of the Sierra Nevada Mountains" has no geography in it, and the slight development of important topics points to lack of care in preparing the material for the press. ROBERT M. BROWN.

SOUTH AMERICA

Studi di Geomorfologia Argentina. Di G. Rovereto. 1: La Sierra di Cordova. 2: Il Rio della Plata. 3: La Valle del Rio Negro. pp. 102-142. Maps, ill. Reprints, *Bull. Soc. Geol. Ital.*, Vol. 30, 1911, pp. 1-19, pp. 313-350, Vol. 31, 1912, pp. 181-237, Vol. 32, 1913, pp. 102-142. Rome, 1913. 10 x 6½.

These contributions to South American morphology are the outcome of investigations carried on to determine suitable schemes of irrigation. Their contents shed considerable light on the hydrography of the regions examined. The relation of the Sierra de Cordova and the San Luis massif is determined with the hydrographic factor in view. The author points to the existence of separate water systems, the result of the shrinking of a general hydrographic basin into independent units. A cycle of aridity is assumed to cause this condition.

Economic conclusions of practical importance follow these studies. The investigation of the Rio Negro valley, where extensive tracts of land can be reclaimed, is a good instance in point. It is to be hoped that the Dirección General de Irrigación will publish the material gathered by its engineers, part of which has informed the author in these pamphlets. LEON DOMINIAN.

ASIA

Natur- und Kulturbilder aus den Kaukasusländern und Hocharmenien. Von Teilnehmern der Schweizerischen Naturwissenschaftlichen Studienreise, Sommer 1912, unter Leitung von Prof. Dr. M. Rikli. viii and 317 pp. Map, ills., index. Orell Füssli, Zürich, 1914. 9 x 6½.

The interest of these summer explorations of the Swiss naturalists grows with each succeeding year. In this volume we find the excursion of 1912, spent in the mountains which part Armenia from the Black Sea. Six of the monographs deal with the geographical reconnaissance of the Caucasus and three with the Armenian mountain region and the scaling of Mount Ararat, while three more discuss the geognosy of the steppes. The work is supplemented by two excellent papers on the plant and animal life of the regions surveyed. Long held in superstitious awe as unscalable, Ararat proves to be a very easy mountain to negotiate and to such alpinists as the Swiss naturalists the climb offered no difficulty.

EUROPE

The Seine from Havre to Paris. By Sir Edward Thorpe. xxi and 493 pp. Maps, ills., index. The Macmillan Co., New York, 1913. 12s. 6d. 9 x 6.

A delightful account of a leisurely journey up the Seine in a small boat. Apart from the first chapter which deals with the hydrography of the Seine and explains the history and stage of river regulation, the book is devoted

largely to the brief narrative of the day's travel and to more extended accounts of the historical significances of the many riparian towns and sites. The story is made intelligible and attractive by many drawings of specific points of interest along the way, and while many of them are of chapels, streets of doorways, delightful to the artist, there are many which give the Seine a setting and show the character of the country through which it flows. Best of all, the journey can be traced by a map of unusual merit (unusual for a book of travel) and the pleasure in reading the book comes in part from the enlightening influence of a carefully arranged and well executed map.

The book will be of great value to those who contemplate a journey along the Seine and will be an aid to anyone who wishes to know French history and France in detail. ROBERT M. BROWN.

The Spell of Switzerland. By Nathan Haskell Dole. Illustrated from photographs and original paintings by Waldemar Ritter. x and 489 pp. Map, index. L. C. Page & Co., Boston, 1913. $2.50. 8 x 6.

His charming style may perhaps enable Mr. Dole to extend the fascination that he felt amid the scenes and memories of Switzerland over the readers of his book. Yet the author was apparently more affected by the native geniuses of Switzerland like Rousseau and Calvin, whom the mountains inspired, and by visitors, like Coleridge and Shelley, who were roused to supreme effort by the spectacle, than by the thing itself. The story, written in easy, conversational style, chiefly centers around Lausanne and Lake Geneva. The region between Mont Blanc and the Matterhorn receives considerable attention and a brief visit to Zurich and Lucerne completes the itinerary. The pictures are numerous and of unusual merit. ROBERT M. BROWN.

Athens and Its Monuments. By Charles Heald Weller. xxiv and 412 pp. Ills., index. The Macmillan Co., New York, 1913. $4. 9 x 6.

To strike the pick and shovel through the waste of centuries and to reproduce Pausanias must be the end of any such work as this. The deeper the student plies his pick, the more of Pausanias he uncovers to our present knowledge, the better he accomplishes his task. The result is a Baedeker of distant ages. This work is all very new. Through all the centuries the Acropolis with its building complex has been well known, but below the hills the situation of Athens was wholly a matter of conjecture long after Rome had been mapped by generations of patient archæologists. But in the late years, when Athens has been the capital of a Greece once more free, great attention has been paid to the study of its past, a theme particularly dear to the heart of its late king who fostered the national museum and was a stimulating patron of the schools of archæology which have been established in the capital. One who was familiar with Athens only thirty years ago when its soil was scarcely touched below the hills will read with great surprise this handbook of the past in the present. The incomprehensible gaps in Pausanias, which it was then impossible to fill, have very largely been closed, the ancient city is made plain and now we know where and how the Attic citizens lived their daily life, which was by no means all a matter of temples standing on the heights. The value of this book, heightened by lavish illustration, will be as great in the library of the student as in the clear Athenian air.

WILLIAM CHURCHILL.

A History of Inland Transport and Communication in England. By Edwin A. Pratt. xii and 532 pp. Index. E. P. Dutton & Co., New York, 1912. $2. 7½ x 5½.

Nearly two hundred pages of this volume supply an exceedingly interesting introduction to transportation in the railroad era. The author begins with early British and Roman roads whose main purpose is shown to have been the carriage of metals to the coast for commerce with the continent. Following the Roman occupation was a period in which the church was the main influence in maintaining such roads as the people had. More than eleven centuries passed, from 411 A. D., the time of Roman withdrawal, to 1555, the date of the first general act for the repair of the roads.

There are chapters on carriages, coaching, the age of bad roads, the turnpike system, and scientific road making. The account of bad roads shows vividly that Americans are not quite so far behind the mother country in road improvement, as we are wont to think. The account of scientific road making deals with Telford and Macadam, whose main work was in the early part of the nineteenth century, coincident in time with the first great epoch of road building in the United States.

Interior navigation follows under the topics,—rivers and river transport, river improvement, disadvantages of river navigation, and the canal era. The first of this group of chapters is one of the most interesting in its emphasis on the efficiency of rivers in the early days, in promoting the progress of towns on their banks, when the inter-stream areas were difficult of access. One of the examples noted at some length is the Severn and its branches bordered by many towns and on whose waters in 1756 there were nearly 400 vessels.

About half the volume relates to the history and administration of English roads and here the author is in the field of much of his previous work. From the origin and expansion of railroads he passes to chapters on railroads and the state, rates and charges, the railroads of to-day, and railroads as a national industry. Two chapters are given to yet more modern ways of transport, such as street cars, the motor bus, cycles and electric traction. The "Outlook" discusses among other questions that of aerial transportation. A rather full list of authorities is included in the volume. A. P. BRIGHAM.

WORLD AND PARTS OF IT

La Grande Boucle. Notes et Croquis de l'Ancien Continent et des Deux Amériques. Par Maurice Rondet-Saint. vi and 314 pp. Map. Plon-Nourrit et Cie, Paris, 1910. 7½ x 5.

The author writes with nervous vigor and photographic effect. Most of his matter is adapted to give the general reader useful, and in the main, correct information about many of the important places he visited on his extended journey. Occasionally, however, he is inaccurate and, at least in our country, he seems unfairly influenced by his prejudices. Most of us are "Yankees" and his comments on the various phases of this particular species of the human race are flippant and funny. It is to be regretted, if true, that any mention of our Far West always suggests to the author "the romances of Fenimore Cooper." This idea introduces his remarks on Seattle-Tacoma, nearly 3,000 miles west of the region where Cooper and many of the Indians he depicted lived out their days.

PHYSICAL GEOGRAPHY

Das Gesetz der Wüstenbildung. Von Johannes Walther. 2. neubearbeitete Auflage. xv and 342 pp. Ills., index. Quelle & Meyer, Leipzig, 1912. Mk. 12. 10 x 7.

The appearance of a splendid new edition of this long since exhausted work by the "desert geologist" Walther, is an event of importance to students of geological science. The delay in issuing the new edition has been due to the author's wish to complete further desert studies with a view to clearing up many subjects concerning which uncertainty existed. As a result we now have an essentially new book comprising twice the number of pages and including three times the number of illustrations. The illustrations are high grade half-tones made from excellent photographs. Remarkable as they are as examples of what good modern book-work may be, they are as a whole even more noteworthy as well selected types in illustration of the characteristic desert processes.

The author's clear and graphic style and his excellence of presentation are here shown at their best. Despite the wealth of observed fact and the introduction of a good many exact figures, the interest never flags, and one

reads under a certain fascination as the desert scenes are one after the other unrolled as upon a huge panorama. If we take account of the psychology of our geological theories, it must be realized that they have almost throughout been modeled from the ever-present scenes of the generally habitable humid countries. It has mattered little that a fifth of the continental surface is desert, a much larger area half-desert, and that with much probability these proportions were even larger in the geological past. In so far as the contrasted geological processes characteristic of arid and humid regions have been appreciated at all, they have thus far influenced but little our conceptions of the great erosional and depositional processes in present or past time. More than any other, Professor Walther has focused attention upon these essential contrasts, and in the face of much opposition is forcing a reluctant recognition of the importance of studying the deserts in order correctly to interpret the past. Such a recognition is necessarily slow, since it involves a making over of fundamental doctrines of the science of geology.

It was a study of the enormously thick deposits of barren conglomerates, sandstones and shales with their included gypsum and salt layers, belonging to the transition from Paleozoic to Mesozoic in Europe, which, a quarter of a century ago, drove Walther into the desert for a possible solution of the puzzle. Later journeys have since been undertaken until now his personal experience of desert conditions includes both borders of the Red Sea, Egypt and the Sudan, and the arid lands of Turkestan and North America. It is by correlation of facts drawn from so many widely separated regions that the general principles underlying desert processes have been skillfully deduced.

The book is divided into 31 sections organized under the four heads: (1), the essential conditions of deserts; (2), desert weathering and transportation; (3), desert deposition; and (4), the earlier deserts. The four types of climate recognized are: nival or snow climate, the humid climate, the arid climate, and the pluvial climate. Each is generally characterized by a special type of precipitation and a characteristic color of soil. Where a nival climate prevails precipitation occurs mainly as snow, and the soil is gray to black according as organic acids have leached out the materials. With humid climate precipitation takes place mainly as rain in summer and as snow in winter, the soils being characteristically rust-brown in color from oxidation and hydration of iron. In a land of arid climate there is little precipitation of any kind and the soils, altered but little chemically, retain their original and varied colors, though the finer wind-borne portions, when carried to the moister zones at the desert margin, become rust-brown. Lastly, the pluvial climate with heavy rain precipitation and high air temperatures is characterized by deep red soils covered by a heavy mat of vegetation.

One of the most striking contrasts between arid and humid regions is brought out in maps of the divides or watersheds. Of humid countries it is true that the divides radiate from the highest point and continue to divide and subdivide until they reach the sea, but nowhere touching or crossing each other. In a region without outflow, on the other hand, they cross and recross to form the network of larger and smaller meshes.

The desert weathering process which in the original edition was described as *insolation*—the rending of rocks when highly heated on the surface under the desert sun and suddenly chilled by a dash of rain—is much more fully treated in the new edition and supported by admirable illustrations. We think it unfortunate that a term already in general use to describe the distribution of the sun's rays over the globe should have been given a new meaning, and we have elsewhere suggested the term *diffision* as more appropriate.

The general lack of rain, which in humid countries carries the air with it into the soil so as to ventilate and oxidize the soil particles, accounts for the far more varied (original) hues of rock débris within a desert. Chemical decomposition of rocks there involves wholly different reactions from those of humid regions. Proof of this is supplied by the hard rock rinds and altered cores of the loose desert rocks which contrast so strongly with the reversed relationships in those found within humid regions. In addition to the brown protective rock rind generally known as "desert varnish" and

believed to be due to a drawing out of salts from the interior and fusion reactions at the surface of the rock, Walther has distinguished two additional types of coating. These are described as "dust rinds," where fine rock dust carried by a strong wind is driven into all surface cracks and pores; and "cataract rinds," formed beneath the water in stream rapids and composed, as Lucas has shown for those seen at Assuan, mainly of manganese and iron oxides together with lime silica and magnesia.

As in the earlier edition, the pan-like form of deserts is probably somewhat too strongly emphasized. The extended high plateau, or hamada, which American and French savants in particular have made known, has not influenced Walther's general definitions as much as it should have done. Likewise the statements concerning a desert's lack of outflow are somewhat too emphatically made in view of the examples of the Nile and Colorado particularly. To the many striking characteristics of deserts which were brought out in the original edition of the work, is now added that of a surface armor due to the removal by the wind of all materials which readily succumb to weathering processes and become finely divided, thus leaving a layer composed of the various hard and insoluble concretions. Such an armor is naturally best developed upon the high hamadas which are preeminently areas of removal rather than of deposition of débris. Yet of the broadly extended weather pans it is likewise true that the peculiar weathering processes and the lack of the shielding mat of vegetation found in humid regions, makes all rock material which can succumb to the disintegrating agencies the special prey of the winds to be by them carried out of the desert. Walther believes that the great pans themselves have originated by this process, and supports his view by such a wealth of well ordered observations as to be quite convincing.

The book is marred by an extended and ever recurring argument to support the author's view that what has been brought forward as evidence from the deserts of changes of climate may all be explained by local cloudbursts. He would appear to be unaware of the existence of the most important recent literature upon the subject. It is really remarkable that in the list of 157 monographs treating of deserts with which the work is concluded, the names of Raphael Pumpelly and Ellsworth Huntington should nowhere appear. The book throughout takes far too little account of other than German workers. It is none the less a great work and as a general treatise upon the subject of desert geology altogether unique. A very large proportion of the illustrations have been drawn from Egypt so that the book may be used to special advantage by the many who visit that country and make the trip up the Nile Valley to the cataracts. WM. HERBERT HOBBS.

Studi di Geomorfologia. Di Gaetano Rovereto. Vol. 1: 1.—Alcuni problemi di geologia e di morfologia della Corsica; 2.—Il M. Cervino; 3.—La Val San Giacomo; 4.—La Valle della Cetina in Dalmazia; 5.—Le Alpi Apuane; 6.—Il M. Cònero; 7.—l'Isola di Capri. 270 pp. Ills. E. Olivieri & Co., Genova, 1908. 10 x 7.

This is a final contribution to the author's investigations on coastal morphology. The sequence in his researches is apparent. He has proceeded systematically inland from the sea-shore by examining valleys first and the mountainous regions at their head afterwards. Each of the regions described must be considered as an applied example of principles previously advanced by him. The hydrography in each case has been investigated with particular care. The results of human occupation are considered somewhat too briefly for a region like the basin of the Mediterranean where the relation of man to land forms might be worked up admirably. LEON DOMINIAN.

Sand Dunes and Salt Marshes. By Charles Wendell Townsend. 311 pp. Ills., index. Dana Estes & Co., Boston, 1913. $2. 8½ x 6.

For twenty years the author has studied the sand dunes and salt marshes of Ipswich, and all the forms of life associated with these physiographic features. The scientific data collected are presented in this book. Some of

the subjects discussed are sand dunes, their evolution and their relation to life; animal tracks in the sand and how to decipher them and read their story; vegetation, land and sea birds, seals. The general topics described in connection with salt marshes are similar to those considered under sand dunes. The book concludes with a chapter on bird genealogy dealing with the evolution of the physical attributes, habits and general life of the bird. The many fine photographs have a definite relation to the text, which they serve to make yet more clear. The volume would be well worth having for the illustrations alone. WILBUR GREELEY BURROUGHS.

ECONOMIC AND COMMERCIAL GEOGRAPHY

The Improvement of Rivers. A Treatise on the Methods Employed for Improving Streams for Open Navigation, and for Navigation by Means of Locks and Dams. By B. F. Thomas and D. A. Watt. 2nd edition, rewritten and enlarged. Part 1: xiv and 333 pp. Part 2: viii and pp. 334-749. Maps, ills., index in each. J. Wiley & Sons, New York, 1913. $7.50. 2 vols. 12 x 10.

Government reports and the publications of waterway associations have dealt extensively with the problem of river improvement but most of the conclusions of these publications assume an issue against a counter doctrine, and the reader fears lest the evidence has not been openly stated. Scarcely a book available to the English reading public had treated the subject of the improvement of rivers until the first edition of the books by Thomas and Watt appeared; and in the new edition the authors have followed their policy of stating the facts without formulating opinions concerning current theories of waterway regulation.

The book opens with an excellent summary of the characteristics of rivers and this is followed by a general chapter on the principles of regulation which are exemplified in the large streams of Europe and America. In succeeding chapters the various types of work are considered. These formulate a basis of fact for the student of the problem and prepare him for a large view of the question which is attracting much attention to-day. Dredging and snagging, dikes, protection of banks, levees, storage reservoirs, river outlets, locks and dams are all treated in a masterly way. In every case the question is discussed broadly and the evidence from the experimentation on many streams under their varying physical conditions gives a proper approach to the subject of regulation. The first volume has for its special topic the improvement by regulation and the second volume discusses improvement by canalization. The text is illumined by a vast array of drawings, pictures and plates which seem to be indispensable to the volumes, but it is unfortunate that so excellent a work on a topic of great importance to us should have the handicap of a high price and much bulk. ROBERT M. BROWN.

Geographie des Welthandels und Weltverkehrs. Von Dr. Ernst Friedrich. viii and 429 pp. Maps, index. Gustav Fischer, Jena, 1911. Mk. 11. 10½ x 6½.

This is a handbook rather than a text-book. Friedrich has been known for the past fifteen years as one of the leading German authorities on economic and commercial geography. He has had an important part in systematizing the subject for study in the schools. This work is the rich result of the many years he has spent in the coordination, study and teaching of the topic. His arrangement of the material is that now largely employed in German text-books. In Part I he collates the general principles of trade and communications, the natural and human influences that affect them and the plant, animal and mineral materials with which they deal. He devotes Part II to a discussion of the special trade and commerce of each of the continents. A notable feature of the work is the great mass of data on every phase of the topic, and this, by the way, is characteristic of all of Friedrich's writings. The work ranks with the best handbooks in its class and will be helpful to all teachers of this branch of geography.

Carriage by Sea. By Jiujiro Ito. In Japanese with an English abstract of 10 pp. Part I: 180 pp. Part II: 267 pp. Map. Waseda Univ., Tokyo, 1911. 9 x 6.

The work is an expansion and in parts an amplification of the doctor's thesis presented by Dr. Ito at the University of Pennsylvania. Carriage by sea is defined to include conveyance both of persons and merchandise and the kinds are classified according to routes, to kinds of vessels, kinds of traffic and to management.

In his discussion of the development and economic and political effects of marine carriage the author recognizes the highly competitive nature of the business if allowed to spring up in response to geographical conditions, and the highly monopolistic nature if restricted by legislation, subsidies and combinations. Contrary to some writers he seems to believe that a nation's colonial expansion is in proportion to her sea carrying capacity

G. D. HUBBARD.

Handelsgeographie. Von Dr. Karl Zehden. 11. vollkommen umgearbeitete Auflage. Bearbeitet von Dr. Robert Sieger. iv and 702 pp. Map. Alfred Hölder, Wien, 1911. 9 x 6.

The first edition of this book was practically the pioneer in the long list of text-books on commercial geography. It was a good product and an inspiration to later writers, some of whom evolved improvements in presenting the subject for educational purposes. Dr. Sieger, of the University of Vienna, has changed the book in many respects to make it conform more closely with present methods of presenting the topic to students. It still contains an enormous amount of data like all other German texts on the subject. In this respect it differs from recent similar texts in English which aim to emphasize principles and not to overload them with a vast array of facts.

GENERAL

Geologen Kalender. Begründet von K. Keilhack. Herausgegeben unter Mitwirkung der Deutschen Geologischen Gesellschaft. 10. Jahrgang für die Jahre 1913-14. 302 pp. Bearbeitet von W. Quitzow. Max Weg, Leipzig, 1913. Mk. 4. 7 x 5.

The 1911-12 issue of this useful publication was reviewed in the *Bulletin*, Vol. 43, 1911, pp. 786-787. In the present edition a slight increase in format and the use of thinner paper have made possible a volume only half an inch thick, which fits readily into the pocket. The usual valuable features are maintained: a directory of geologists, a list of the geological surveys and geological societies of the world, information about the International Geological Congresses and the International Geological Map of Europe, etc. A section, published for the first time in this edition, is devoted to the Geological Map of the World, accompanied by an index map. There are also various tables of interest to the geologist.

OTHER BOOKS RECEIVED

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A GUIDE TO FLORIDA for Tourists, Sportsmen and Settlers. By Harrison Rhodes and Mary Wolfe Dumont. With a Chapter on the Inland Waterways from New York to Key West. 456 pp. Maps, ills., index. Dodd, Mead & Co., New York, 1912. $2.25. 6½ x 4½.

THE YELLOWSTONE NATIONAL PARK. Historical and descriptive. By H. M. Chittenden. Seventh edit. x and 355 pp. Maps, ills., index. Stewart & Kidd Co., Cincinnati, 1912. $1.50. 7½ x 5½.

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THE POCKET GUIDE TO THE WEST INDIES. By Algernon E. Aspinall. New and revised edition. xv and 315 pp. Maps, ills., index. E. P. Dutton & Co., New York, 1911. $1.50. 7 x 4½.

TEMBLORES, TERREMOTOS, INUNDACIONES Y ERUPCIONES VOLCÁNICAS EN COSTA RICA, 1608-1910. Datos compilados por el Lic. Cleto González Viquez. 200 pp. Ills. Avelino Alsina, San José, 1910. 9½ x 6½.

SOUTH AMERICA

THE UNITED STATES OF BRAZIL WITH A CHAPTER ON THE REPUBLIC OF URUGUAY. By C. W. Domville-Fife. xxiii and 249 pp. Map, ills. J. Pott & Co., New York, 1913 (?). $2.50. 9 x 6.

PERU OF THE TWENTIETH CENTURY. By P. F. Martin. xx and 348 pp. Map, ills., index. Edward Arnold, London, 1911. $4.20. 8½ x 5½.

THE PATH OF THE CONQUISTADORES. Trinidad and Venezuelan Guiana. By L. Bates, Jr. vii and 308 pp. Map, ills., index. Houghton Mifflin Co., Boston, 1912. $3.50. 9 x 6.

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THE KHALIFATE OF THE WEST. Being a general description of Morocco. By Donald Mackenzie. xiv and 274 pp. Maps, ills., index. Simpkin, Marshall, Hamilton Kent & Co., London, 1911. 10s. 6d. 9 x 6.

LIBERIA: DESCRIPTION, HISTORY, PROBLEMS. By Frederick Starr. xiv and 277 pp. Map. The Author, Chicago, 1913. 7½ x 5.

THE MINERAL INDUSTRY OF RHODESIA. By J. P. Johnson. 90 pp. Index. Longmans, Green & Co., New York, 1911. $3. 8½ x 6.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. COAST AND GEODETIC SURVEY*

Alaska. [Two maps:] (1) Tlevak Narrows, S. E. Alaska. Surveyed 1912. 1:20,000. 55°16.5′ - 55°13.5′ N.; 133°11′ - 133°5′ W. 1 color. (2) Sukkwan

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* Only new charts are listed, not new editions of old charts.

Narrows, S. E. Alaska. Surveyed 1912. 1:20,000. 55°12.5′ - 55°9.5′ N.; 132°53′ - 132°49.5′ W. 1 color. Chart No. 8153. Oct. 1913. Price 30 cents.

Canal Zone–Panama. Panama Canal and Approaches. [Mean scale, 1:145,000.] 9°25′ - 8°25′ N.; 80°0′ - 79°25′ W. 5 colors. Chart No. 954. Feb. 1914. 30 cts.

[One of the new charts published in view of the prospective opening of the Panama Canal. A similar one, No. 953, showing the Pacific approaches to the canal on a larger scale, was listed in the March *Bull.* (Vol. 46, p. 234). On Chart No. 954, colors are exceptionally used, the water being shown in light blue, the canal in deep blue, Panama territory in buff and the Canal Zone in pink.]

North Carolina. Pamlico River. 1:40,000. 35°34′ - 35°18′ N.; 77°5′ - 76°38′ W. 1 color. Chart No. 537. Feb. 1914. 50 cts.

[Replaces old Chart No.144[1] on the scale of 1:80,000.]

Philippine Islands. [Two maps:] (1) Silangan Pass, East Coast of Luzon. Surveyed in 1907. 1:20,000. 14°2.5′ - 13°58.0′ N.; 122°8.5′ - 122°12.5′ E. 1 color. (2) Hondagua Harbor, East Coast of Luzon. Surveyed in 1907. 1:20,000. 13°58.0′ - 13°53.5′ N.; 122°10.5′ - 22°15.0′ E. 1 color. Chart No. 4273. Oct. 1913. 20 cts.

NORTH AMERICA

United States

Colorado. (a) Topographic Map of Colorado. Prepared by R. D. George from maps and data of the U. S. Geological Survey; the . . . Hayden, . . . King . . . and . . . Wheeler [Surveys]; the State Geological Survey of Colorado; Land Plats in the office of the Surveyor General (Denver); Maps of the U. S. Reclamation Service, and the U. S. Forest Service; Maps furnished by county officials, railway companies, industrial corporations, State Highway Commission, etc. 1913. 1:500,000. 9 colors. With four insets, 1:126,720, in 1 color: (1) Canon City District, (2) Vicinity of Leadville, (3) Part of City and County of Denver, (4) Cripple Creek District.

(b) Geologic Map of Colorado. 1913. 1:500,000. 66 colors.

Published by the Colorado State Geological Survey, Boulder, Colo.

[Map (a) is an excellent general map of Colorado showing relief in contours (interval 500 feet), supplemented by six hypsometric tints in brown (change of color at 5,000, 7,000, 9,000, 11,000 and 13,000 ft.). Drainage is in blue, railroads and towns (copious nomenclature) in black, state highways in green, national park and forest reservation boundaries and military reservations in red. The omission of all topographical detail within the administrative limits of Denver is to be regretted. The base used is one of the state maps on the scale of 1:500,000 prepared by the U. S. Geological Survey as a basis for the compilation of the relevant sheets of the International Map of the World, 1:1,000,000. This series of maps is an excellent incentive to the preparation of general state maps by the individual states, and Colorado is to be congratulated upon having made so admirable a start.

Map (b) will doubtlessly become the standard geological map of the state and a worthy successor to Hayden's similar map on the smaller scale of 1:760,320 (Sheet IV of his Atlas of Colorado, 1877) which was based on the large-scale sheets in 1:253,430 in the same atlas. Thirty-seven sedimentary formations and 12 types of igneous rocks are distinguished. The regions of which geological folios have been published are shown in detail, while the surrounding regions are shown undifferentiated. This, of course, leads to an unnatural and disconnected appearance which, it might be argued, were better avoided on a general map.]

AFRICA

British East Africa. (a) Sketch Map to illustrate a paper by Capt. C. N. French (Hants Regt.). From a Compass Traverse by G. F. Archer, 1911-12. 1:3,000,000. 4½° - 2° N.; 40° - 43° E. With inset, 1:40,000,000, showing location of main map.

(b) Explorations and Surveys in the Northern Frontier District by G. F. Archer. 1909-12. 1:800,000. 3°45′ - 0°20′ N.; 36°28′ - 39°13′ E. 2 colors. With two insets: (1) Chart of Triangulation. 1:2,000,000. (2) [Sketch map of British East Africa and adjoining region showing location of main map]. 1:12,-000,000. 1 color.

Accompany: map (a), on p. 431, "A Journey from the River Juba by Dolo, Moyale, and Mount Marsabit to the Uaso Nyiro (British East Africa: II)" by C. N. French, and, map (b), "Recent Exploration and Survey in the North of British East Africa (British East Africa: I)" by G. F. Archer, *Geogr. Journ.*, Vol. 42, 1913, No. 5, pp. 430-435 and 421-430, respectively.

[Valuable maps covering together the ill-known northern part of British East Africa from Lake Rudolf to the Juba River. Map (b), which comprises the western portion of this region, is based on a system of triangulation; relief is shown in brown contours, drainage in blue. A list of positions, expressed in geographic coordinates, also accompanies the map.]

Egypt. The Farafra Depression and Bu Mungar Hattia, by W. J. Harding King, 1912. 1:1,250,000. 27°25′ - 25°10′ N.; 27°17′ - 31°0′ E. 1 color. With inset, 1:20,000,000, showing location of main map. Accompanies "The Farafra Depression and Bu Mungar Hattia" by W. J. Harding-King, *Geogr. Journ.*, Vol. 42, 1913, No. 5, pp. 445-461.

[Valuable map, based on a route survey by the author, comprising the depressions of the Kharga, Dakhla and Farafra oases, the last of which had not yet been completely surveyed by the Survey Department of Egypt. Bu Mungar is a *hattia* (an uncultivated and not permanently inhabited oasis) lying to the southwest of Farafra whose existence has only been known within the last few years and whose astronomical position was first determined on this journey. Relief (scarps and dunes) are shown in brown; previous travelers' routes (Rohlfs, 1874; Lyons, 1894; Beadnell, 1897; Hoskins, 1906-07) in black. Cf. also the same author's maps of (1) Kharga, Dakhla and the region to the southwest, and of (2) the Libyan Desert in general, listed in the *Bull.* under "Sahara," Vol. 44, 1912, p. 477, and Vol. 45, 1913, p. 957, respectively.]

French West Africa. Colonie du Haut-Sénégal-et-Niger: Carte du Bambouk et des régions avoisinantes. Dressée par A. Meunier. 1:200,000. [In six sheets, 1 color, viz.:] (1) Feuille 1. 15° - 14° N.; 12°40′ - 11°40′ W. (2) Feuille 2 [with title]. 15° - 14° N.; 11°40′ - 10°40′ W. (3) Feuille 3. 14° - 13° N.; [12°40′]- 11°40′ W. (4) Feuille 4. 14° - 13° N.; 11°40′ - 10°40′ W. (5) Feuille 5. 13° - 12° N.; 12°40′ - 11°40′ W. (6) Feuille 6. 13° - 12° N.; 11°40′ - 10°40′ W. [Ministère des Colonies, Paris, no date (later than 1909).]

[Important official map on relatively large scale embodying all existing information. The route and other surveys on which it is based are listed on the title sheet (Feuille 2). The region shown comprises the western edge of the West Sudan plateau lying between the upper Senegal and Gambia Rivers, the Bambuk region being that portion of it which is included between the upper Senegal and its source stream, the Bafing, and the Faleme River. Drainage is in blue and relief (mainly *Inselberge* and escarpments) in generalized contours in black; railroads, constructed and projected, are also shown.]

ASIA

Turkey in Asia. Der Zug des Cyrus durch Kappadozien und Zilizien verglichen mit der Trasse der Bagdadbahn. Entworfen von Walter Siehe. 1:750,000. 38°20′ - 35°40′ N.; 32°10′ - 37°20′ E. 3 colors. Accompanies, as Taf. 39, "Der Marsch des Cyrus durch Kappadozien und Zilizien" by W. Siehe, *Petermanns Mitt.*, Vol. 59, II, 1913, Oct., pp. 233-236.

AUSTRALASIA AND OCEANIA

German New Guinea. Die Admiralitätsinseln (Deutsch-Neuguinea). Auf Grundlage der deutschen Seekarte ergänzt von Dr. Ludwig Cohn. 1:500,000. 1°50′ - 2°35′ S.; 146°28′ - 147°52′ E. 2 colors. With inset: Der Unterlauf des Liai. 1:50,000. 2°2′ and 147°15′ E. 2 colors. Accompanies, as Taf. 52, "Beobachtungen von den Admiralitätsinseln" by L. Cohn, *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., pp. 315-320.

Kaiser Wilhelms Land. Vorläufige Karte des Gebietes des Kaiserin-Augusta-Flusses (Sepik). (Kaiser Wilhelmsland). Nach den neuesten Forschungen, besonders nach den Aufnahmen von Dr. W. Behrmann zusammengestellt von M. Moisel. 1:2,000,000. 3°2′ - 5°16′ S.; 141°45′ - 145°25′ E. 1 color. Accompanies, as Taf. 53, "Zur Luftschiffexpedition nach Neuguinea," *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., p. 327.

[Based on the map listed under the same heading in the *Bull.*, Vol. 45, 1913, p. 718. Relief in contours.]

EUROPE

Balkan Peninsula. Die neuen Grenzen des Königreichs Serbien. Nach Angaben des kgl. Serbischen Generalstabes. Die neuen Grenzen des Königreichs Bulgarien gegen Rumänien, Serbien und Griechenland. Nach dem Vertrag von Bukarest vom 20. Juli (10. August), 1913. 1:1,500,000. 45⅔° - 40⅓° N.; 16½° - 30° E. 10 colors. Accompanies, as Taf. 54, "Die neuen Grenzen des Königreichs Serbien und Bulgarien" by P. L[anghans], *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., p. 34.

[A somewhat elaborate reprinting of Sheets 51 and 52 of Stieler's Hand-Atlas, in view of the fact that the boundaries shown are necessarily not complete. The new Serbo-Bulgarian, Serbo-Greek, Greco-Bulgarian and Bulgaro-Rumanian boundaries are shown as definite, while the Serbo-Montenegrin, Serbo-Albanian and Albano-Montenegrin are shown as provisional and the new Turco-Bulgarian boundary is not shown at all. For general purposes the maps referred to in foot-note 1 on page 819 of the November *Bull.* (Vol. 45, 1913), in their newest edition, are still the best. Just why one map should have two titles is also not apparent.]

Germany. Die Talsperren im Königreich Sachsen. Nach der Karte des Kgl. Sächs. Hydrotechnischen Amtes in der Leipziger Internationalen Baufachaustellung 1913 reduziert von Oswald Winkel. 1:500,000. 51⅗° - 50° N.; 12° - 15° E. 3 colors. Accompanies "Die Talsperren im Königreich Sachsen" by O. Winkel, *Petermanns Mitt.*, Vol. 59, II, 1913, Nov., p. 263.

[Shows sites of 87 dams for industrial purposes, mainly on the Saxon slope of the Erzgebirge, of which 3 are in operation, 4 under construction, 30 in a preliminary stage and the remaining 50 merely projected. The drainage basins of the Weisse Elster, the Mulde, the Elbe and the Spree are shown. The base is an extract from Vogel's map of Germany, 1:500,000.]

Spain. Der Lago de San Martin (Castañeda) in der Provinz Zamora (Spanien). Nach eigenen Aufnahmen und Lotungen von Prof. Dr. Wilhelm Halbfass, 1912. 1:10,000. [42°10′ N. and 6°45′ W.] 6 colors. Accompanies, as Taf. 49, "Der Castañedasee, der grösste Süsswassersee Spaniens, und seine Umgebung" by W. Halbfass, *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., pp. 306-312.

[Original survey, with soundings (isobaths: 10 meter interval), of a small morainic lake just north of the northeastern corner of Portugal.]

CARTOGRAPHICAL

World. (a) Das Deutsche Reich und seine Kolonien: Schiefachsige abstandstreue Zylinderprojektion mit zwei längentreuen Kleinkreisen oder schiefachsige rechteckige Plattkarte. Entwurf und Zeichnung von Oswald Winkel, Leipzig. 1:85,000,000. 60° N. - 30° S.; 40° - 170° W. 1 color.

(b) Die beste querachsig-echtzylindrische Abbildung des Atlantischen Ozeans, von Kartograph Oswald Winkel, Leipzig. 1:85,000,000. 85° N. - 54° S.; 120° W. - 50° E.

Accompany, as Taf. 45 and 46, respectively "Beitrag zur Entwicklung schiefachsiger, speziell zylindrischer Projektionen unter Annahme der Kugelgestalt der Erde" by O. Winkel, *Petermanns Mitt.*, Vol. 59, II, 1913, Nov. and Dec., pp. 241-245 and 304-306.

[Suggestions for a more appropriate than the customary representation of large regions whose median line does not coincide with a meridian, as a colonial empire or the Atlantic Ocean, by selecting an oblique cylindrical projection.]

ATLASES

Atlas of Railway Traffic Maps. By William Arthur Shelton. (One of a series of texts on Interstate Commerce and Railway Traffic.) 21 maps. La Salle Extension University, Chicago (1913). $3. 12 x 10.

[While primarily of value to railroad traffic managers the maps in this atlas are not devoid of interest to the student of economic geography. The most valuable maps are those showing the freight rates obtaining between various freight association territories (Maps Nos. 3, 4, 9 and 10). These are generally expressed in percentages of the rates in force between two main points, as New York and Chicago. The resulting maps in their complexity of enclaves and exclaves strongly resemble—and possibly for an analogous reason—the territorial kaleidoscope of medieval Europe. The preponderance of economic over political factors is also evident from the dependence of certain regions contiguous to the United States, such as the southernmost part of the Interlake Peninsula of Ontario, which belongs to the Central Freight Association Territory (Map No. 8), and all of Mexico, which forms part of the Southwestern Tariff Committee Territory (Map No. 6). There are, besides, a map showing the freight rates on grain to New York from Illinois, Indiana, Ohio and Lower Michigan, a parcel post map and others. The last five maps, which represent certain of the large railroad systems of the country, are such as are used for advertising purposes in railroad folders. While the topic is preeminently fitting in such an atlas, the inclusion of these distorted and diagrammatic maps with their self-laudatory text is hardly appropriate, especially when such relatively good material as Gray's map (listed under "United States" in *Bull.*, Vol. 44, 1912, p. 155) or Aberle's map is available. The fact that the base maps used in the atlas are, for the greater part, of the crudest wax-engraved type is less the fault of the publisher than of the low standards of the map engraving firm to which they naturally turned inasmuch as it specializes in railroad work. A minor item of make-up may also be noted: In the case of the folded maps the fact that they are attached to their stubs in the middle rather than on the edge (as is done in *Petermanns Mitteilungen*, for instance) will, we believe, soon lead to their wearing through in the center of the map where the creases meet—a matter not entirely unimportant in a book intended for reference and for use as a textbook.]

Other Maps Received

NORTH AMERICA

CANADA

Western Canada. Railway Map of Western Canada. [1:1,700,000.] Theodore Seyler, Calgary, Alta., 1913.

Map of Manitoba, Saskatchewan and Alberta, showing the number of quarter-sections available for homestead entry in each township, also the preemption and purchased homestead area as defined by the Dominion Lands Act, 1908. Corrected to May 1, 1913. 35 miles to 1 inch. Rialway Lands Branch, [Ottawa].

UNITED STATES

Connecticut. Hammond's New Road Map of Connecticut (Western part), based on the Surveys of the U. S. G. S., U. S. C. & G. S., and the various local surveys, revised and corrected. 1:125,000. C. S. Hammond & Co., New York, 1913. Price 50 cents.

Hammond's New Road Map of Connecticut (Eastern part), based on the Surveys of the U. S. G. S., U. S. C. & G. S., and the various local surveys, revised and corrected. 1:125,000. C. S. Hammond & Co., New York, 1913. Price 50 cents.

New York. Hammond's New Road Map of Dutchess and Putnam Counties (New York), based on the Surveys of the U. S. G. S., U. S. C. & G. S., and the various local surveys, revised and corrected. 1 mi. to 1 in. C. S. Hammond & Co., New York.

Indexed Street Map, Greater New York. (Shows all streets in Manhattan, Bronx, Brooklyn, and Queens Boroughs.) Wehman Bros., New York. Price 25 cents.

New York-New Jersey, etc. Hammond's Enlarged Road Map of the Country around New York. 2 mi. to 1 in. C. S. Hammond & Co., New York, 1912. Price 50 cents.

AFRICA

French Equatorial Africa. Afrique Équatoriale Française: Congo de Léopoldville à Brazzaville. Plan levé d'Août à Septembre 1911 par la Mission Hydrographique Congo-Oubangui-Sanga sous la direction de M. H. Roussilhe. 1:10,000. [Ministère des Colonies, Paris.]

ASIA

China. Karte von Tschili und Schantung. 1:200,000. Sheets: B11 to B13, C8 to C17, D8 to D17, E9 to E17, F9 to F17, G9 to G17, H9, H10, H14, H17, I 13 to 16, K13, K14, L13, L14. [Names given in Chinese and German characters.] Bearbeitet in der Kartogr. Abteilung der Kgl. Preuss. Landesaufnahme, Berlin, 1907.

EUROPE

Austria. Post-Kurs-Karte von Böhmen. 1:400,000. Inset: Post-Ämter im Stadtgebiete von Krakau. Bezirk der k. k. Post- und Telegraphen-Direktion Prag. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte der Bukowina. 1:400,000. Inset: Czernowitz. Bezirk der k. k. Post- und Telegraphen-Direktion Czernowitz. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Dalmatien. 1:400,000. Insets: Post-Kurs-Karte von Bosnien u. d. Hercegovina, 1:1,000,000; Zara. Bezirk der k. k. Post- und Telegraphen-Direktion Zara. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Galizien. (Blatt I.) 1:400,000. Inset: Post-Ämter im Stadtgebiete von Krakau. Bezirk der k. k. Post- und Telegraphen-Direktion Lemberg. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Krain und dem Österreichisch-Illyrischen Küstenlande (Triest, Görz und Gradisca, Istrien). 1:400,000. Insets: Post-Ämter im Stadtgebiete von Triest; Laibach. Bezirk der k. k. Post- und Telegraphen-Direktion Triest. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Mähren und Schlesien. 1:400,000. Insets: Brünn; Troppau. Bezirke der k. k. Post- und Telegraphen-Direktion Brünn und Troppau. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Oesterreich unter der Enns. 1:400,000. Inset: Wien. Bezirk der k. k. Post- und Telegraphen-Direktion Wien. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Steiermark und Kärnten. 1:400,000. Insets: [Graz];

[Klagenfurt]. Bezirk der k. k. Post- und Telegraphen-Direktion Graz. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Post-Kurs-Karte von Tirol und Vorarlberg und dem Fürstentume Liechtenstein. 1:400,000. Inset: [Innsbruck and environs]. Bezirk der k. k. Post- und Telegraphen-Direktion Innsbruck. Vom Post-Kurs-Bureau des k. k. Handelsministeriums, 1913.

Balkan Peninsula. G. Freytags Karte von Montenegro, mit den angrenzenden Gebieten Österreich-Ungarns, Serbiens und Albaniens. 1:600,000. Verlag der Kartogr. Anstalt G. Freytag & Berndt, Ges. m. b. H., Wien.

[Only new Albano-Montenegrin boundary shown.]

Denmark. Illustreret Skole- og Turistkort over København og Nordsjaelland ved Gustav Rosendal. Scale about 1:16,000. Insets: Kort over Københavns Omegn, Kort over Nordsjaelland og Øresund. Kommission: Rasmus Hansens Boghandel, Odense. 25 Øre.

France. Topo-Guide des principales voies d'accès des massifs du Sulens et du Mont Charvin ou Grand-Carre en Haute-Savoie, dressé par J. Serand et édité avec le concours du Syndicat d'Initiative d'Annecy. 1:50,000. Syndicat d'Initiative, Annecy, 1913. Fr. 0.30.

Topo-Guide des principales voies d'accès du Mont Veyrier (rive droite du Lac d'Annecy), dressé par J. Serand et édité avec le concours du Syndicat d'Initiative. 1:33,333. Syndicat d'Initiative, Annecy, 1913. Fr. 0.30.

Germany. Post- und Eisenbahn-Karte des Deutschen Reichs in XX Blättern. 1:450,000. Bearbeitet im Kursbureau des Reichs-Postamts, 1905-1910.

Postleikarten, 1:450,000: 1. Königsberg in Pr., Gumbinnen. 2. Köslin, Danzig, Bromberg (Posen). 3. Breslau, Oppeln (Posen, Liegnitz). 4. Stettin, Potsdam, Berlin (Schwerin, Frankfurt). Inset: Ober-Postdirektionsbezirk Berlin. 5. Dresden, Leipzig, Chemnitz. 6. Kiel, Hamburg, Bremen (Hannover, Schwerin). 7. Minden, Braunschweig, Madgeburg, Cassel, Erfurt. 8. Oldenburg, Münster, Düsseldorf. Inset: Umgegend von Düsseldorf, Elberfeld, Dortmund. 9. Aachen, Cöln, Coblenz, Frankfurt. 10. Metz, Strassburg, Karlsruhe, Konstanz. 11. Königreich Bayern—München, Landshut, Regensburg, Augsburg, Nürnberg. Bearbeitet im Kursbureau des Reichs-Postamts, [Berlin], 1913.

Geologische Karte von Preussen und benachbarten Bundesstaaten. 1:25,000. Lieferung 168. Sheets: Krummesse, Schwarzenbek, Nusse, Siebeneichen, Hamwarde. (Grad-Abteilung 25, Nos. 14, 25, 20, 26 and 31.) Königlich Preussische Geologische Landesanstalt, Berlin, 1911.

Italy. Carta Politico-Amministrativa del Regno d'Italia, colle linee ferroviarie e di navigazione. 1:2,000,000. Istituto Geografico Italiano del Dott. G. De Agostini & C., Roma. Lire 1.50.

Switzerland. Übersichtskarte über die Kantone St. Gallen und Appenzell. 1:150,000. Geograph. Artist Anst. Kümmerly & Frey, Bern, 1912.

WORLD AND LARGER PARTS

World. Karte der grossen Postdampfschifflinien im Weltpostverkehr. 1:47,-000,000. Insets: Ostchina, 1:6,700,000; Deutsche Schutzgebiete im Stillen Ocean, 1:31,300,000; Nordsee und Kanal, 1:10,800,000; Mittelländisches Meer, 1:18,-000,000; Togo und Kamerun, 1:15,000,000; Deutschsüdwest-Afrika, 1:11,200,000; Deutschostafrika, 1:10,000,000. Bearbeitet im Kursbureau des Reichs-Postamts, Berlin. Verlag: Berliner Lithographisches Institut Julius Moser, Berlin, 1907.

EDUCATIONAL

Europe. Middel-, West- en Zuid-Europa, door P. R. Bos. 1:650,000. J. B. Wolters, Groningen, 1892.

[Excellent physical wall map bringing out relief with great delicacy although perfectly legible at a distance. The best school wall map of Western Europe extant.]

AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156TH STREET

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BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

VOL. XLVI 1914 No. 5

A METHOD OF ESTIMATING RAINFALL BY THE GROWTH OF TREES*

By A. E. DOUGLASS, Sc.D.
Department of Physics and Astronomy
University of Arizona

In the great northern plateau of Arizona, lying at an average altitude of 6,000 feet above the sea, the higher elevations are covered with forests of yellow pine (*Pinus ponderosa*), a fine timber tree with heavy cylindrical trunk and bushy top. The trees are scattered gracefully over the plains and hills, and, with the remarkable absence of undergrowth, render travel through their midst attractive and delightful. For centuries these magnificent pines have stood there, enduring the vicissitudes of heat and cold, flood and drought. The possibility that they might serve as indices of the climate of the past led the author to begin the investigation of the matter in 1901. His line of reasoning was as follows: (1) The rings of a tree measure its food supply; (2) food supply depends largely upon the amount of moisture, especially in this dry climate where the quantity is limited and the life struggle of the tree is against drought rather than against competing vegetation; (3) in such countries, therefore, the rings are likely to form a measure of the precipitation. In planning the work three fundamental steps were anticipated. First, to prepare a curve of tree growth; second, to find if there exists in this any connection with precipitation; third, by carrying this back through long periods to find whether meteorological variations, if discovered, show association with astro-

* Portions of a chapter from a forthcoming volume to be published by the Carnegie Institution of Washington, under the title "The Climatic Factor as Illustrated in Arid America," by Ellsworth Huntington, with contributions by Chas. Schuchert, A. E. Douglass and C. J. Kullmer.

nomical phenomena. A fourth step has been added by Dr. Ellsworth Huntington, namely, the application of such tree records to the investigation of historical conditions and events.

Advantages of Location. The pine tree of northern Arizona lends itself peculiarly well to the investigation here contemplated. Not only is its situation favorable climatically, and because of the absence of other vegetation and of pests which might seriously alter the growth of the tree, but the soil is of such a nature that variations in precipitation are quickly felt in the tree. The tree itself is favorable, because of its conspicuous annual rings. The difference between the soft, rapidly growing white tissues of the summer, and the slow-growing reddish layer formed in the fall, is much less conspicuous in most of the common trees than in the pine. The sharp, outer edge where the growth of the red layer is checked by the cold of winter, gives a precise point from which to measure.

Meteorological records in northern Arizona are necessarily meager, yet not so deficient as might be expected. The record at Whipple Barracks, near Prescott, which was begun in 1867, is the longest continuous record in the pine forest, and is therefore made use of below.

The Collection and Measurement of Sections. At the beginning of the investigation it was foreseen that enough trees would have to be measured to give a real average. The trees would have to be spread over enough country, and be sufficiently numerous to eliminate accidents of grouping and other minutely local conditions, and yet they must not extend beyond a single meteorological region. They must be numerous enough to be susceptible of division into groups, which, by showing common characteristics, would testify to the genuineness of whatever variations appeared. Accordingly in the first series of measurements twenty-five trees from near Flagstaff were made use of. They were divided into three groups: A, six trees from three miles south of Flagstaff; B, nine trees from about eleven miles southwest of Flagstaff; C, ten trees a mile west of the last. The method of measurement consisted of determining the thickness of each annual ring in millimeters along some typical radial line. The average age of the trees was 348 years, with two extending to 520 years, more than a hundred years before the discovery of America. The total number of individual measurements reached over ten thousand. A comparison of the three groups clearly reveals the general character of the variations hereafter to be discussed.

Other interesting facts also came to light. It was especially noticeable that years of marked peculiarities could be identified in different trees with surprising ease. Perhaps the most characteristic feature was a group of narrow rings about the years 1879-1884. These could be identified in practically every tree, and an examination of stumps scattered about the country showed that it was easy to pick them out wherever one chose. In the case of one stump near town, which had been cut some twenty years previously, this group of rings enabled the writer to name the year in which the tree was felled, and the date was verified exactly by the owner of the land. In the more recent work this same group shows conspicuously among Prescott trees, and in general 95 per cent. of these trees have rings so characteristically marked that the identification of the same series can be made with little doubt whether at Flagstaff or at Prescott.

As a rule, the thickness of a given ring is not uniform on all sides of the tree. It varies slightly for accidental reasons, and also according to the points of the compass. The maximum growth occurs a little to the east of north. The average variation between the maximum growth in the northerly direction and minimum growth to the south is 12 per cent. The relative width of rings in different radii of a tree is wonderfully constant in these Arizona pines. This is not so of all trees.

The Dating of Rings. In comparing the growth of trees and the rainfall over long periods of years, it is essential that the date of formation of any individual ring shall be certain. As a rule, each annual ring is extremely well marked, and there is no doubt as to its purely annual or seasonal character. In some cases, however, rings die out completely, while in others they are double. Such defects tend to cause errors in dating the earlier rings. In the first investigation of the trees at Flagstaff, it was thought that the final result was subject to an error of 2 per cent., most of which occurred near the center of the tree from doubling. The more rigorous methods subsequently employed, however, proved that the error of unchecked counting in those trees was 4 per cent., and lay almost entirely in the recent years. It was due chiefly to the omission of rings. Such errors can only be guarded against by a process of cross identification which will be described shortly. The common effect of errors of omission or doubling of rings is to lessen the intensity of the variations in the curve of growth. After cross identification, however, I find the remaining errors may be divided

into two classes, first, local errors of identity in small groups of rings in a few individual trees, which simply flatten the curve in one small part, without affecting other portions at all; and, second, cases in which a given ring, in spite of all attempts at cross identification, is still in doubt. This error does not flatten the curve at all but does lend the same doubt to the date of all earlier rings.

The Trees of Prescott. The problem of cross identification is well illustrated in the trees of Prescott. These were measured in 1911 for the purpose of testing the conclusions derived from the Flagstaff trees some years earlier. About 3,500 measures were made upon 64 cuttings selected in five groups depending on their nearness to town. The farthest group was 10 miles southeast and the nearest one mile south. It was apparent that the agreement between growth and precipitation increased as the location of the actual rainfall station was approached. The nearest group, containing ten trees, shows so much greater agreement than do the others that it has been used alone in drawing final conclusions.

The chief feature of the Prescott series which places its results on a firmer basis than any previous work is the cross identification of rings between trees. The extent and accuracy of this identification came as a surprise to me. After measuring the first eighteen sections it became apparent that much the same succession of rings occurred in each, and, thereupon, the other sections were examined and the general appearance of some sixty or seventy rings memorized. All the sections were then reviewed and identification marks placed in the wood against certain rings. Some conspicuous characteristics were noted, such as that the red ring of 1896 is nearly always double; the rings of 1884 and 1885 are wider than their neighbors. The most pronounced feature was a series of compressed rings from 1878 to 1883 (as noted at Flagstaff), preceded by a very faint 1877 and then a wider series. Out of 67 sections averaging fifty rings each, only two proved puzzling, and they are mentioned here because they were the worst cases of defective ring systems observed in this entire investigation. After minute examination it finally appeared fairly certain that one of them had the rings from 1879 to 1887 merged into one, and the rings from 1890 to 1895 merged into one. The other had the rings from 1890 to 1895 in one and 1898 to 1900 in one. Previous to those dates the rings were entirely normal, showing perfect agreement with the other trees.

The cross identification of trees from the Prescott region was

limited to a district only ten miles long. It was a surprise then to find that rings in the Flagstaff sections could be identified at once in terms of the rings at Prescott. The process appears to be applicable to areas still farther removed from one another. Two trees out of three which were tested from the Santa Rita Mountains in southeastern Arizona, 200 miles from Prescott, were found to have rings which could readily be identified in terms of the Prescott series.

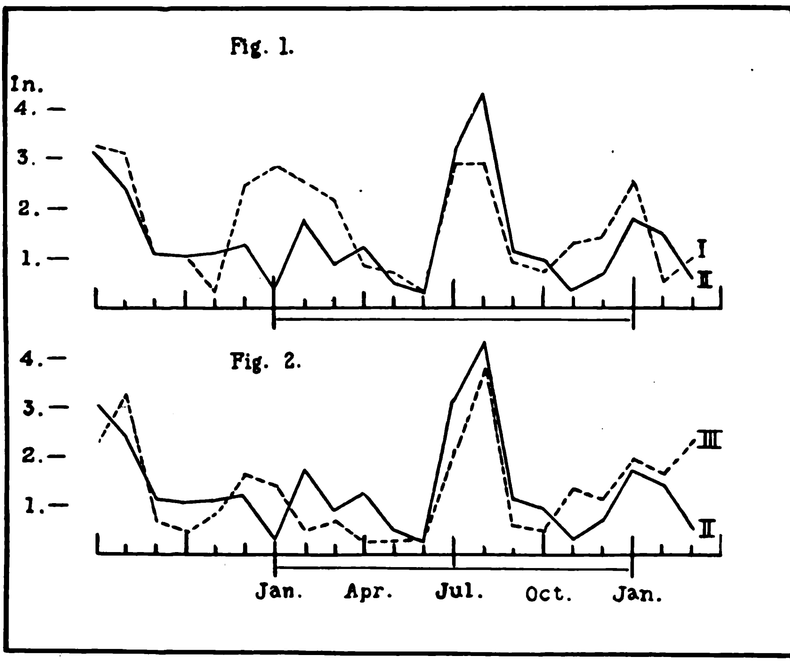
Yearly Identification. Upon the complete comparison between the Prescott trees only one ring contained a doubt, namely, the sixth counting in from the bark: did this ring represent 1904 alone or was it really a double representing both 1903 and 1904? The decisive evidence strangely enough came from Flagstaff. The cross identification between the sections from Prescott and Flagstaff made it possible to identify most of the rings both before and after 1903, and Flagstaff plainly showed two rings in place of the doubtful ring or rings at Prescott. Hence this was apportioned to the two years 1903 and 1904. Apparently if a sufficient number of comparisons be made and if the trees thus compared be distributed over widely different localities, the yearly identification of rings may be made with almost perfect certainty (see footnote 1).

Month of Beginning Annual Means. Before passing on to other matters, a word of explanation must be added as to the method of calculating the rainfall.

That it must take some time for the transmutation of rain into an important part of the organic tissue is evident. Moreover, snow cannot be absorbed until it has melted. At Flagstaff the precipitation of November is almost always in the form of snow, and therefore that month should certainly be considered as falling after the arboreal new year. Hence for purposes of comparison with tree growth, the month of beginning annual means would fall some time in the autumn. This matter has been tested empirically. Annual means have been formed beginning at various months from July 1st of the previous year to March 1st of the current year. These were compared with the tree growth, and it was found that the years beginning November 1st at Flagstaff and September 1st at Prescott give the closest agreement. These dates therefore are used.

The Time of Year of Ring Formation. Among the problems connected with the relation of the growth of trees and the amount of rainfall, one of the most interesting was suggested by Mr. R. H.

Forbes of the Arizona Experiment Station. The problem is to determine the time of formation of the red or autumn portion of the rings, and the causes of the doubling. This study is the more necessary because many rings in the Prescott series, although very few at Flagstaff, show a faint, preliminary red ring, forming a double. The first test was designed to determine the distribution and character of the rainfall in the years producing such double rings. The half-dozen most persistent years of doubling were



Figs. 1 and 2—Rainfall and Doubling of Rings.

I. Monthly rainfall in years producing large single rings.
II. Monthly rainfall in years producing large double rings.
III. Monthly rainfall in years producing small single rings.

selected and their mean rainfall plotted month by month. This forms the solid line in Figure 1. Six other years averaging the same growth, 1.55 mm., but producing single red rings, were then selected and the monthly rainfall plotted as before. This forms the dotted line in the same figure. The curves seem to indicate clearly that the chief cause of doubling is a deficiency of snowfall in the winter months, December to March. This means that if the winter precipitation is sufficient to bridge over the usual spring drought, the growth continues through the year, giving a large

single ring which ends only in the usual red layer as the severity of winter comes on. If, however, the preceding winter precipitation has not been entirely adequate, the spring drought taxes the resources of the tree, and some red tissue of deficient absorption comes on in summer.

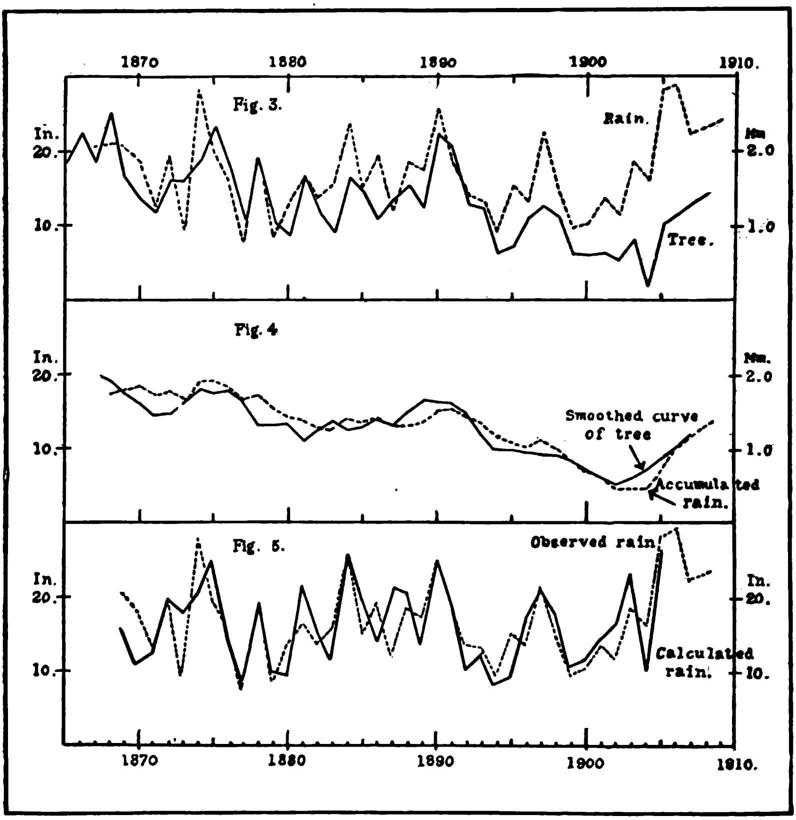
It appears further that if the few spring drought rains are unusually scanty, then the tree may "close up shop" for the year and produce its final red tissue in midsummer, gaining no immediate benefit from the summer rains, even though they are abundant. This appears to be the interpretation of Figure 2. Here the same six double-forming years used above are plotted, together with a list of six years selected for small single rings particularly deficient in red tissues. In these it is evident that extreme drought in the spring stops the growth of the tree. The double ring then seems to be an intermediate form between the large, normal, single ring, growing through the year, and the small, deficient, ring ending its growth by mid-summer. So also the red tissue appears to be formed in times of decreasing absorption, whether following excessive spring drought or the waning activities of autumn.

Rainfall and Tree Growth at Prescott and Their Relation

All the preceding investigations lead up to the actual comparison between tree growth and rainfall and the question of the accuracy with which one represents the other. A complete answer will necessarily require a large amount of work and pass beyond the scope of this article but even now some definite idea may be obtained. Figure 3 displays a forty-three year comparison obtained at Prescott, Arizona. On the whole there is close agreement, as may be seen by matching the crests and troughs of one with those of the other. These curves, then, support the idea of a proportional relation between annual rainfall and annual growth.

In order to obtain a still more accurate idea of this relationship, an effort has been made to construct formulas for reducing one to the other. Without entering into details, it is sufficient to say that the result gave an agreement of over 80 per cent. This is shown in Figure 5, whose slight errors might fairly be expected considering the mile or more of distance separating the trees from the rainfall station. Figure 4 shows the main basis of transition from Figure 3 to Figure 5, namely that the mean growth of the tree is proportional to the accumulated rain. Regarding any formula, however,

it should be emphasized that one found to apply in dry climate conditions, such as exist in Arizona, is likely to be very different from one operating in moist climates and perpetually water-soaked ground.



FIGS. 3 to 5—Rainfall and Tree Growth at Prescott, Arizona, 1865–1908.
Fig. 3. Tree growth and rainfall, uncorrected.
Fig. 4. Accumulated rainfall and smoothed curve of tree growth.
Fig. 5. Observed rainfall and computed rainfall.

THE FLAGSTAFF 500-YEAR CURVES

In the preceding portions of this article, we have endeavored to determine the exact relation between growth and rainfall, and to ascertain the most accurate method of obtaining results. We shall now apply these conclusions and methods to the oldest available trees. For this purpose 19 of the Flagstaff sections were selected, and were subjected to minute examination and cross identification,

in order, as far as possible, to eliminate all errors due to the omission or doubling of rings. For convenience in handling the sections, each one was reduced to a strip of wood extending from center to bark. The best of these was adopted as a standard. It was then compared with each of the others, ring for ring. In the entire period only one ring was held as doubtful, that of 1822, which was often merged with that for 1821. The two rings appear as one in ten sections, and as two in only nine, but in many or most of the cases where it appeared as two, they were so distinctly separate that they were finally so regarded. This is not absolutely certain, however, and thus there may be an error of one year in the portions of the growth before 1822. So far as known, there is no probability of any other error.[1]

Test of Accuracy of Record in Small Groups. In studies like the present, it is manifestly desirable to carry the curves of growth as far back as possible. Inasmuch as only a few trees go back to an age of over 300 or 400 years, the curves for earlier centuries may be less accurate than those for later. In order to test the degree of accuracy to be obtained from a small number of trees, a comparison was made between large groups and small. After the entire number of rings, some 6,300 in all, had been identified and numbered, their measures were tabulated in overlapping groups, and in a convenient manner averages were obtained of the oldest five reaching back 400 years; the oldest ten (including the preceding five) reaching back 350 years; the oldest fifteen (including the ten) reaching 300 years, and the entire nineteen reaching only 200 years. Finallv at the ancient end of the first group, the oldest two were carried back to fully 500 years. On plotting these various groups, it was immediately evident that five trees gave almost the same record as ten or fifteen, even to small details. So in the work discussed below, the five are used to give the record from about 1503 to 1906. In a similar manner, the comparison between these five and the oldest two taken by themselves gave an agreement not quite so perfect, yet so close that errors thus introduced will not at all affect the curves referred to below. However, the oldest two were

[1] Some months after writing the above, I reviewed H. H. Bancroft's "History of Arizona and New Mexico" with special reference to climatic records. Some fourteen cases of agreement with the Arizona tree record as thus identified were found, to one doubtful case of disagreement, and the identification here used was considered as confirmed, having no likelihood of error in any part. Regarding this particular case Bancroft says, on page 302: "Irrigation generally protected the inhabitants against drought, as in 1808 and in 1820-2"; and on page 309, note 8, he states that in 1823 the Indians claimed to be dying of hunger. The trees show poor growth in 1820 and 1823 and *very* poor in 1822, thus forming a group of poor years corresponding well with his description of drought and famine from 1820 to 1823.

very slow-growing trees and they required on the average an increase of about 30 per cent. in order to make their curve continuous with the whole five. Thus the tree record is made to begin at 1392. In the recent years of the record also, between 1891 and

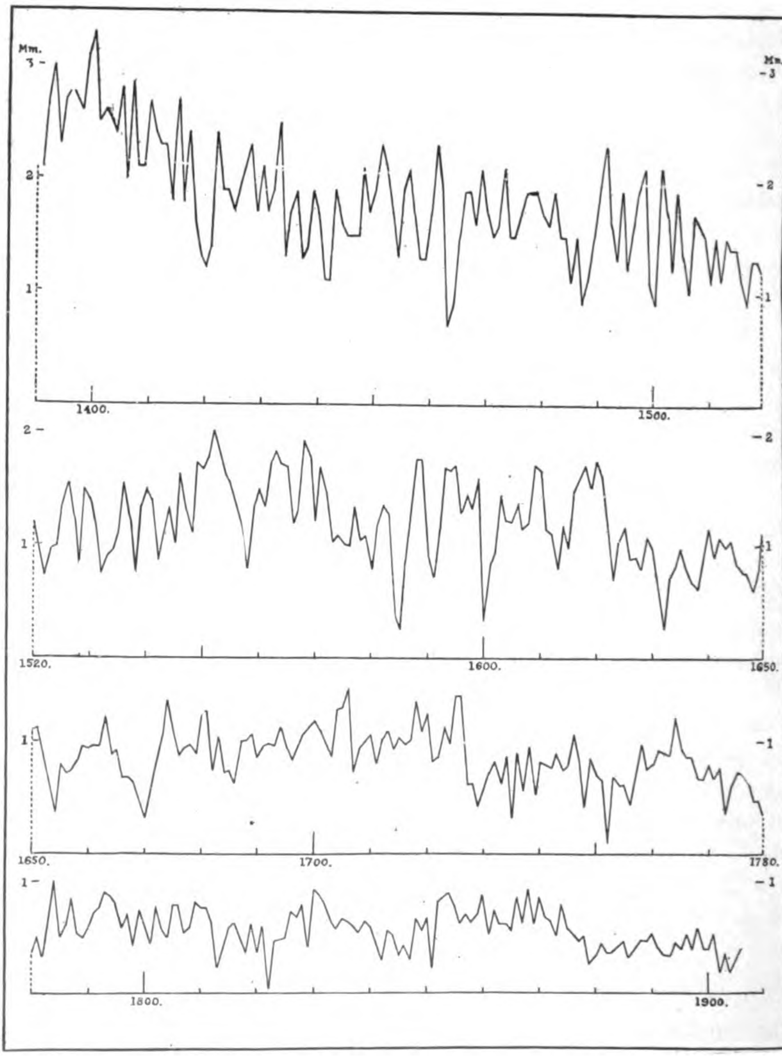


Fig. 6—Tree Record in Northern Arizona, 1392-1906.

1896, a slight correction was made for omitted rings, the complete omission of a ring being an exaggeration that introduces error. Thus Figure 6 gives the tree record for northern Arizona from 1392 to 1906, inclusive, a period of 515 years.

Climatic Cycles. Investigations of rainfall are undertaken for the purpose of predicting the future. The basis of daily or short distance prediction is found in the conditions existing about the country at a given moment and a knowledge of the usual movement of storm areas. A basis for long distance prediction is now generally sought in climatic cycles. Such cycles may or may not be permanent. Perhaps they are nothing more enduring than a series of wave systems on a water surface. Yet for the navigator a knowledge of the existing system is important, and so for the purpose of weather prediction we need to know the nature of the pulsations actually operating, and each one should be studied minutely. For this purpose the very long tree record and its presumable fair accuracy seem especially advantageous, since it gives us a range in centuries which the meteorological records with few exceptions give only in decades. In order to adapt it properly for this purpose it has been corrected empirically for age by drawing a long, sloping, nearly straight line through it from end to end, averaging its growth and then calculating the percentage of departure of each year from this line.

The 33-Year and Longer Variations. In order to bring out the longer variations the curve was smoothed by 20-year overlapping means. The result gives four conspicuous crests about the years 1400, more or less, 1560, 1710 and 1865, suggesting a very long period. A period of 33.8 years fits very well since 1730, with a total amplitude of some 25 per cent., and very poorly before that, yet without entire discordance. The last crest came in 1900. This we readily identify as the well-known Brückner period.[2]

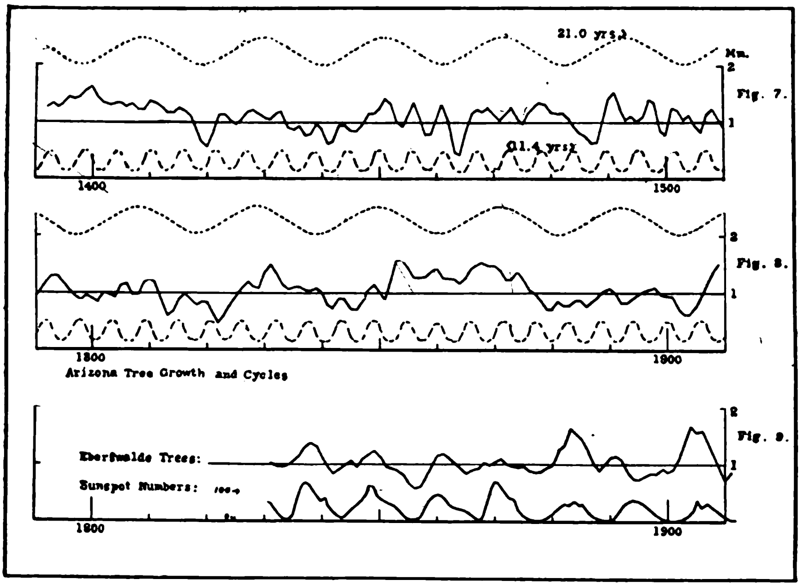
A 21-Year Period. The most persistent of the longer periods seems to be approximately 21 years in length with an average amplitude of 20 per cent. (10 per cent. from the mean), and its last crest in 1892. This pulsation is well marked from 1410 to 1520; then in the next hundred years it has three or four glaring discrepancies; finally from 1610 to the present time it is again strongly marked and very regular. Dr. W. J. S. Lockyer, in his "Discussion of Australian Meteorology"[3] finds a pronounced 19-year cycle in barometric pressures in Australia and South America. The 21-year period was worked out independently in 1907 and 1908, from an early and crude tree record of 200 years. It seems quite possible that these two periods are the same. If so, and if my inter-

[2] "Klimaschwankungen seit 1790"; see also H. W. Clough, *Astrophysical Journ.*, Vol. 22, 1905, July, p. 42, and many others.

[3] South Kensington Solar Physics Observatory, 1909.

pretation of the tree curves is correct, the real value is likely to be closer to 21 years since the time interval here investigated is about ten times as long as his. Something of this 21-year variation is shown in the dotted lines of Figures 7 and 8. The application becomes more evident when the minor variations are smoothed.

The 11-Year Cycle. The last cycle to be considered is that of eleven years. In the sixty years during which the eleven-year sunspot and magnetic cycles have been accepted, this period has been of the greatest interest, for, if found to be terrestrial, it must signify a connection between the sun and the earth other than



FIGS. 7 and 8—Arizona Tree Growth and Cycles, 1390-1510 and 1790–1910 (21-year period, dotted; tree growth, solid; 11.4-year double cycles, broken line).

FIG. 9—Eberswalde (Germany) Trees and Sunspot Numbers, 1830–1910.

gravity which holds the earth in place, and the mere constant heat energy which sustains all life. Since 1873 numerous writers (Koeppen, Bigelow, Lockyer, Abbott, Buchan, Hann, Hellmann, Arctowski and others) have found variations in the ordinary meteorological elements, rainfall, temperature, pressure, etc., corresponding to this period. But so much disagreement appeared at the same time between different workers, and the periods of time used were so short, that much doubt has remained. Hence it is of peculiar interest to see whether the trees which carry the rainfall record back so far with a comparatively high degree of accuracy,

show the same cycle. In nearly all parts of the long, 500-year curve, there are plain suggestions of an eleven-year variation. By tracing these throughout the record, the most satisfactory period is found to have a length of very nearly 11.4 years, which is practically the sunspot cycle. (The sunspot cycle is sufficiently variable to render almost any period between 11.0 and 11.8 equally applicable, since 1755. This will be discussed and illustrated in another place.) The average double amplitude of the tree period is 16 per cent. The average form of this cycle during different portions of the last five centuries has been ascertained, from which it appears that it is not uniform throughout (see Figure 10). In general the curve shows two maxima and two minima: from 1400 to 1670, the second is the deeper and its recurrence most regular, as shown in Figure 7; from then to 1790 the curve flattens out and has less marked cyclic character, or the period of the cycle is varying; from that time to the present, there are again two minima, but the first is more conspicuous.

Something of this may be seen in Figures 7, 8 and 10. In Figures 7 and 8 the first and last centuries of the tree record are respectively shown, smoothed in each case by Hann's formula. Hann's formula is usually given $T_n^1 = \frac{1}{4}(T_{n-1} + 2T_n + T_{n+1})$ but is better described and obtained as the *second* set of intermediate values, that is, the second set of means of successive, overlapping, pairs. With each are plotted the corresponding sections of a double-crested 11.4-year cycle cast to the best advantage upon the whole five hundred years. By comparing the crests of this cycle with the respective crests in the tree curve, one can see to what degree the tree varies on that particular cycle. Throughout Figure 7 the growth varies closely on the double-crested 11-year period and less perfectly on the 21-year. In Figure 8 the case seems to be partially reversed.

Correlation between tree growth and sunspot variation is not confined to the American region here investigated. A series of measures on thirteen tree sections (*Pinus sylvestris*) from the forest of Eberswalde, near Berlin, Germany, the first of a number of series to be made on North European pine trees, discloses a striking time relation of similar character. Figure 9 exhibits the results on this group. The mean curve for the whole thirteen was corrected for age and smoothed by three-year means. This smoothed curve is given in the figure and below it is the sunspot curve. The similarity may be traced without further comment.

The 11-Year Tree Cycle Compared with Solar and Some Meteorological Elements. A final comparison of the 11-year cycle with

the mean sunspot curve and with two meteorological elements, temperature and rainfall, on the adjacent California coast, gives a significant series of curves. Figure 10 has on its upper line the average of all the 11.4-year periods in the whole five hundred years.

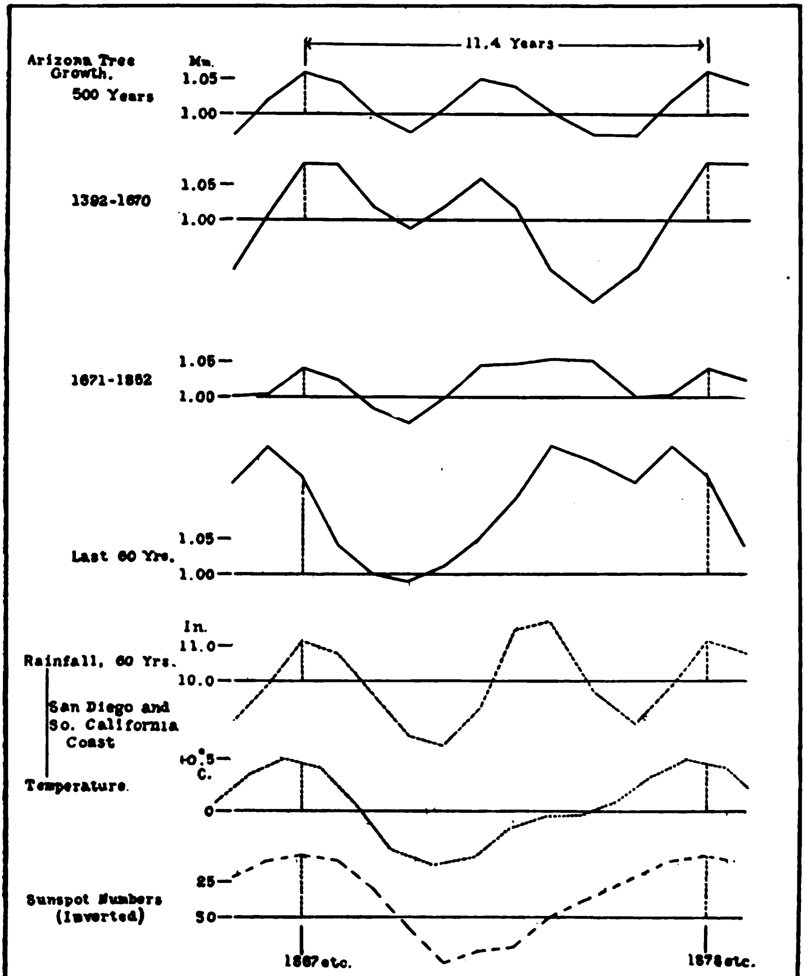


FIG. 10—Study of an 11.4-year Period. First four curves: Arizona tree growth: (1) average for the 500 years covered by the period of investigation; (2 to 4) curves for the periods 1392-1670, 1671-1852 and 1850-1911, respectively. Last three curves: rainfall and temperature on the coast of southern California and inverted sunspot numbers for the period 1850-1911.

Below this is a partial analysis of the same in different intervals in three curves which show variations in this cycle. The last of the three is taken for sixty years only, in order to give an exact com-

parison with the curves which follow. The first dotted curve is the coast rainfall for sixty years arranged on identical periods. Although this coast is five hundred miles distant from the Arizona trees, and lies beyond the mountains, yet the crests and troughs of the tree growth in Arizona match those of the rainfall in California. This is not surprising, for while the summer rains of northern Arizona have no relation to those on the coast, the winter precipitation in the two regions varies in harmony. Below the rainfall curve is placed another, showing the average temperature at San Diego during the 11-year periods since 1850. Shorter curves of temperature and rainfall of other coast towns show the same characteristics as those of San Diego. The lowest curve shows the sunspot numbers (inverted) for the same interval from 1850 to the present time.

There appears to be a marked similarity between these curves. Even the subordinate crest which sometimes shows in the change from maximum to minimum sunspots, matches the suppressed second crest of temperature and the full second crests of rainfall and tree growth. This would seem impossible in the absence of a real relationship between them.

Conclusion. Further research will probably show other, and perhaps still more important, relationship between the growth of vegetation, meteorological elements and changes in the sun. Meanwhile, the methods of computing rainfall from tree growth must be still further perfected. Already, however, the original purpose of the work here outlined has been accomplished. A connection has been found between tree growth and rainfall, a curve of tree growth has been made for at least one locality, apparent climatic cycles have been observed and indications of association between meteorological and astronomical phenomena have been found. But the most important part of all, I hope, has been the origin and development of a method of estimating rainfall, capable of extension to other regions, and of adaptation to other branches of science.

EFFECTS OF CONTINENTAL GLACIATION ON AGRICULTURE*

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3. Glacial Soils

(*a*) *Characteristics Distinguishing Glacial Soils from other Soils and their Agricultural Significance.* Glacial soils may be regarded as composed of a thorough mixture of mechanically derived material from many rock types, especially when they comprise a portion of the drift sheet resulting from continental glaciation. Such soils have been subject to solvent denudation only since their deposition by the glaciers, geologically a very short time. Residual, alluvial and other soils outside the glaciated areas, are, in contrast with the glacial soils, mostly accumulated as the result of chemical weathering and represent the relatively insoluble material of the rocks from which they are derived, or the stable secondary compounds formed during the processes of chemical weathering. Mechanical weathering has some part in the accumulation of a mantle of rock waste in non-glacial regions, but its influence is largely confined to the detachment and splitting up of larger rock fragments, which, by such processes, are made the more susceptible to complete disintegration and recombination later by chemical means. Thus non-glacial soils in humid, agricultural regions owe their characteristics primarily to the effects and results of chemical reactions on the bed rock from which they are derived. Under such conditions the relatively soluble materials of the bed rock are carried away while the resistant original minerals and the stable secondary compounds compose the soil particles.

To this contrast in origin—the glacial soils made up of mechanically derived detritus, a mixture of all the materials from many rock types, while the non-glacial soils are chemically derived insoluble residues—is commonly ascribed the greater average fertility, productiveness and value of the glacial soils. The conception is that the mechanically derived mixtures forming the glacial soils contain the mineral plant foods both in greater actual amount and in a more available form than do the weathering soils. Such data

* Concluded from the April *Bulletin*, pp. 241-264.

as are available[27] indicate that this is actually the case and probably accounts in part for the greater agricultural worth of the glacial soils. While a detailed discussion of this phase of the subject cannot be entered into here, it should be stated that it is maintained by some soil investigators that the capillary rise of water from subsoil and underlying bed rock, brings up more than enough of the soluble mineral plant food materials to compensate for the downward movement and leaching of such materials by the action of gravitational waters sinking through the larger soil pores during the relatively short periods of rainfall. If their contention is correct, textural variations in soils are more important than differences in the amounts of mineral plant foods present, as shown by chemical analyses, which latter do not necessarily indicate their availability for plants.

However, if the greater agricultural value of the glaciated lands were dependent on differences in soil composition alone, it would not be determined by merely chemical considerations. As has been shown above many other factors enter in to give the advantage agriculturally to the glaciated provinces. But, eliminating these for the moment, there are reasons, other than actual chemical make-up, inherently characteristic of the glacial soils themselves which may be cited to account for their greater productivity.

Local conditions of weathering and character of the bed rock are largely determinant of the nature of sedentary soils, both of their textural and chemical make-up. In consequence of this, where the country is alternately underlain by good and poor soil makers, the worth of the soils of the region will vary with them, and the phenomenon of fertile and relatively infertile soil in strips and bands is noted. This may be extreme, or only observable on careful examination. That this relation exists and may cause radical soil changes within short distances was clearly shown for an area in southeast England by Hall and Russell[28] of the Rothamstead Experiment Station. These authors also found that the Al_2O_3 of the clay in fertile soils had double the percentage solubility in the fertile as contrasted with the infertile soils, thus indicating that the differences were not wholly of a textural character. In glacial soils such rapid variations due to bed rock character do not occur. While a large percentage of the recognizable material in the de-

[27] von Engeln, O. D.: Some Factors Influencing the Percentages of Mineral Plant Foods Contained in Soils, *Amer. Journ. of Science*, Vol. XXXII, Nov., 1911, p. 350.

[28] Hall, A. D. and Russell, E. J.: Soil Surveys and Soil Analyses, *Journ. of Agric. Science*, Vol. IV, Pt. 2, Oct., 1911.

posits from continental glaciers have been shown to be of local material,[29] this is not to be considered as local in any such restricted sense as in the case of the weathering soils, but local in that it represents largely a commingling of recognizable material from near adjacent areas. The finer material, the rock flour of glacial grinding, probably represents a much greater mixture of material, of which much is from distant sources. Plant growth, further, is much more influenced by the character and percentage of the fine material than by the coarser recognizable particles. In this matter of being a mixture, the glacial soils, therefore, resemble very closely alluvial bottom land or flood plain soils of the non-glacial regions, and these are proverbially fertile. Where, however, the glaciers passed over wide areas of rock, whose soil forming qualities are poor, the glacial soils also reflect in some degree the sterility which would mark soils derived from them by weathering processes.

The content of organic matter as determined by glacial action is another factor which must be recognized as contributing much to the reputed fertility of glacial soils. Thus almost all of the great prairie region of the Central West of the United States is covered by what has been termed the Marshall series of glacial soils.[30] They are characterized and distinguished from the Miami series of glacial soils by the relatively large quantity of organic matter in the surface soils, which gives them a dark brown or black color. These accumulations of organic matter may be ascribed to the very level character of the topography of these areas, due to the conditions of glacial deposit which resulted in poor natural drainage, and, consequently, of incomplete decomposition of the plant residues of their original vegetation cover. With artificial drainage, where necessary, these soils have become the great corn soils of the country and are very productive.

It is interesting to note also that, of the soil types of this series determined by texture, as well as of the other two great series of glacial soils, the Miami and Volusia, the loam, silt loam and clay loam types are noted as being the most valuable for general farm purposes, and that these are also the types which have by far the greatest acreage over the area so far surveyed.[31] Thus it is seen that the glacial soils possess distributional and compositional ad-

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[29] Alden, W. C.: The Delavan Lobe of the Lake Michigan Glacier of the Wisconsin Stage of Glaciation and Associated Phenomena, *U. S. Geol. Surv. Prof. Paper 34.* 1904, pp. 86–87.

[30] Whitney, Milton: Soils of the United States, *Bur. of Soils Bull. 55,* p. 144, U. S. Dept. of Agric., 1909.

[31] Whitney, M.: *op. cit.*, pp. 144–147.

vantages, favorable to agriculture, other than that of simply greater initial content of mineral plant food.

(*b*) *Variation in Age of Glacial Soils with respect to Crop Productivity.* From what has been said above, it may be gathered that the geological youth of the glacial soils is a factor of importance in determining their superior agricultural worth. The original, undecomposed nature of the glacial soil particles, rock flour, and the short time they have been exposed to weathering processes are in part responsible for their so-called lasting and strong qualities in contrast with weaker, non-glacial soils. This distinction may be extended farther to include differences between the glacial soils themselves, according to the relative ages of the glaciations during which they were deposited. Thus Hopkins[32] has shown that, in the several glaciations which have, in the main, given rise to the soils found in Illinois, there is a progressive increase in the mineral plant food content of such soils from the oldest to the youngest. Moreover, a very real difference exists in the actual productivity of the soils of the early and late glaciations, whether or not this depends on the mineral plant foods present in them. Hubbard[33] shows this very strikingly by contrasting the agricultural conditions in the north-and-south adjacent Coles and Cumberland Counties of Illinois, the former lying almost wholly within the Early Wisconsin glaciation, while the latter has a Lower Illinoisan glaciation soil-cover over the greater part of its area. Land values in Coles County at the time the article was written ranged between \$75-\$125 per acre, with the average above \$75; while in Cumberland County (with the older Illinoisan glaciation soil-cover) the prices were between \$15-\$40 with the average near \$30. According to the 1910 census[34] average farm values in Coles County were \$125 per acre and over, while in Cumberland County they ranged between \$50 and \$75 per acre, yet in both counties 90-95% of the land was found to be in farms. According to Hubbard again, the value of crops, per acre of improved land, was from \$10-\$15 for Coles County and from \$6-\$10 for Cumberland County.

It may be that these differences in productivity should be ascribed to conditions of physiographic, rather than geologic youth and age, for in Coles County tile drainage is practiced, rich swamp

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32 Hopkins, C. G., and Pettit, J. H.: The Fertility in Illinois Soils, *Univ. of Ill*, *Agric. Expt. Sta. Bull.* 123, pp. 201-202.

33 Hubbard, Geo. D.: A Case of Geographic Influence upon Human Affairs, *Bull Amer. Geogr. Soc.*, Vol. XXXVI, 1904, pp. 145-157.

34 *Bulletin Thirteenth Census of the United States, 1910: Agriculture, Illnois,* map p. 2.

lands are thus reclaimed, while in Cumberland County such drainage is useless, primarily because tributaries to main natural drainage streams are developed in so much greater numbers as to make the map of Cumberland County appear darker. Thus relative dissection of the glacial deposits themselves apparently makes for differences in crop productivity irrespective of differences in mineral plant food content. Leverett[35] makes clear the very strong contrasts in this respect which appear between the deposits of the different glaciations. "In the Illinoisan glacial drifts of western Illinois approximately one-half the surface has been reduced below the original level as a result of post-Illinoisan glaciation drainage development; while in the Wisconsin drift, post-Wisconsin drainage has scarcely sufficed to reduce one-tenth its original surface." In connection with such weathering and dissection the older glacial soils may have also undergone structural and textual modifications detrimental to fertility. As the youngest glaciations did not extend so far south and east in Central Europe as did the earlier ones it is possible that these glacial lands would show, if an exact comparison could be made, because of their greater age, an average lesser productiveness than do the younger glacial deposits which cover so large a part of the area of the central United States and southern Canada.

(*c*) *Textural Variations of Glacial Soils in relation to Diversified Agriculture.* In its broadest sense the term, intensive agriculture, implies the utilization both of the land and the labor of the man on the land to their utmost extent and according to the best methods and with the best equipment possible. Fulfillment of these conditions involves continual occupation for the labor on the farm. In order that this may be possible a variety of tasks to suit the different conditions of weather and season must be available; accordingly a variety of crops must be grown so that the work does not all come at once. In other words, diversified, as well as intensive agriculture, must be practiced to get the greatest possible economic advantage from the land. Even in regions where intensive agriculture, in the more restricted sense of specialization in one crop, is unprofitable, the opportunity for a diversified agriculture is important, for it means the possibility of producing a large proportion of the variety of foods demanded by the human and animal labor on the farm itself, where field crops are extensively raised for

[35] Leverett, F.: Weathering and Erosion as Time Measures, *Amer. Jour. of Science*, Vol. XXVII, 1909, pp. 856-7.

a money return. Therefore, if the soil over a large area is restricted, texturally and in other characteristics, to a very narrow variation in type, adapted to only a comparatively few crops, such uniformity in soil type is necessarily a detriment to both intensive and diversified farming. This is an economic disadvantage, as, with increasing density of population in civilized countries, a more and more intensive and diversified agriculture must be practiced.

According to present knowledge different plants are more adapted to textural variations than to variations in the other known characteristics of the soil. On the other hand this adaptation of plants to certain soils is often so marked that it has been proposed to classify soils according to their natural typical plant growth. Crops also are adapted to certain soils. A compilation made from a wide range of agricultural literature[36] showed that among others the following crops could be grown in largest quantity and in some cases also of best quality on the textural soil type indicated:

Clay—wheat, timothy, blue grass.
Silt loam—corn, apple.
Loam—red clover, alfalfa, field beans.
Sandy soils—potato, field peas, turnip, barley, rye, buckwheat, peach.
Calcareous soil—white clover.
Muck soils—celery, cabbage, lettuce, onions.

This list includes only such crops as show marked adaptation. It could be much extended if others were included that, other conditions being equally favorable, thrive best on certain soil types.

The application of the above paragraphs is found in the wide variety of conditions which attended the deposition of material by the ice during the retreat of the continental glaciers, giving rise to a great diversity in soil types. A list of the different forms of glacial deposit to which distinctive names have been given will almost suffice to show how wide the range in texture is. Often, moreover, these forms intergrade in a manner most puzzling to the glacial physiographer who attempts to map them, such combinations adding further complexity to the soil texture in the glaciated regions.

Conspicuously developed terminal, recessional and lateral moraines are commonly stony, with a filling of gritty clay between the boulders. Though large boulders may not predominate the materials composing their ridges are typically coarse, sandy and

[36] By Dr. Bouyoucos, formerly of the N. Y. State Agric. College at Cornell University, soil seminar, March 20, 1911.

gravelly, in general unfit for cultivation. In the central plains and prairie region of the United States such morainic masses are commonly given over to farm wood-lots and pasture land. Similarly the coarse stratified material of kames and eskers and their steep topography unfits them for the plow and they are generally timber-covered so that it is difficult to obtain good photographs showing the sinuosities of an esker course. Drumlin forms are equally steep but have better soils texturally; they are, therefore, generally under cultivation. Much more extensive in area over the glaciated regions than the conspicuous ridge deposits of moraine, kame, esker and drumlin, are the lower, more massive moraines, the ground moraine and the till sheet. These forms can not be sharply differentiated in the field. They grade into one another. In general they comprise the material deposited by the ice during periods of slow but essentially continuous melting back. Under such conditions the thin wedge at the front of the ice may be conceived of as fairly clogged with debris, super-, en- and subglacially, a concentration of all the stuff distributed through a much greater thickness of ice back from the front. Away from hilly and mountainous regions this material was probably mainly massed in the lower ice layers, the cargo acquired by erosion and abrasion in the long journey from the centers of ice dispersion. In regions of greater relief, where ridges and summits projected far up into the body of the ice currents, or even through them, in the waning stages, englacial and superglacial material amounted to a much greater bulk of the deposits laid down. Thus the till sheet (embracing in that general term the low massive moraines and the ground moraine) varies in composition from the thin bouldery deposits of the New England uplands (where it has been estimated that in some parts it took on the average a month's work for a man to remove the large stones from each acre to get it ready for plowing) to the deep, fine textured aggradations of the plains areas, derived from prevailing soft rocks, converted into rock flour by glacial grinding under the sole of the ice, and extending now practically level and unbroken over miles of area. Although such extremes in texture occur in these deposits of similar origin the till sheet on the whole supplies a prevailingly fine soil. Of the approximately 24,000,000 acres of area covered by such glacial material that have been mapped in the United States by soil surveys, about 73 per cent. has been found to come within the narrow textural range of loam, silt loam and clay loam. These are all heavy soils adapted to general farming, and they have been desig-

nated the great wheat and corn soils of the country.[37] The smaller areas of coarser, lighter soils, sandy in texture, associated with the loam soils, and part of the same deposits in origin, are well adapted to fruit and vegetable growing, though not yet utilized to their fullest extent. Thus while plenty of opportunity is afforded for variety of crops, the greater proportion of such lands is specially adapted to the growing of the two grains which are staple foods for man and beast.

The surface portions of the till sheet deposits no doubt owe their prevailingly fine texture in part to postglacial weathering, but, in part also, to the influence of outwash waters depositing fine particles between the larger morainic fragments. When the outflowing glacial waters were of greater volume and faster flow, coarser particles could be carried and deposited away from the ice front. Of such origin are the sand plains, outwash gravel aprons, glacial river terraces and valley trains. But associated with these coarser soils are found areas of very fine grained and dense lake clays, deposits in quiet waters of temporary or higher level lakes and ponds of the glacial period. These outwash and lake bottom soils have in general a lower topographic position than the other glacial material, consequently they are nearer the level of the underground water table. This often insures them a water supply where in other positions such coarser soils would drain and dry out too rapidly. Consequently a heavier type of crops can be grown on many of these soils than would otherwise be possible. The sorting action of water has further resulted in a separation of a much greater number of textural grades of soils than in the till-covered areas, and has arranged them in much more definite groups and bands. This combination of conditions gives a great opportunity for specialization in different crops within comparatively narrow areas. On the lake clays wheat, hay, oats and grapes thrive. The clay loams are available for intensive dairying, as they are unexcelled grass lands, and are also adapted to wheat. The loam group, including gravelly and stony loams, is perhaps the most typical of the soils of this region; such are very important for canning-vegetables, producing large yields of fine, firm quality. (Fig. 5.) These are also some of the best fruit soils, especially for apples and pears. Sugar beets and tobacco do well on the sandy loams, as do also peaches. The sandy soils are best for potatoes, strawberries and early vegetables.

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[37] Whitney, M.: The Use of Soils East of the Great Plains Region, *Bur. of Soils Bull. No. 78*, pp. 26 and 129, U. S. Dept. of Agric.

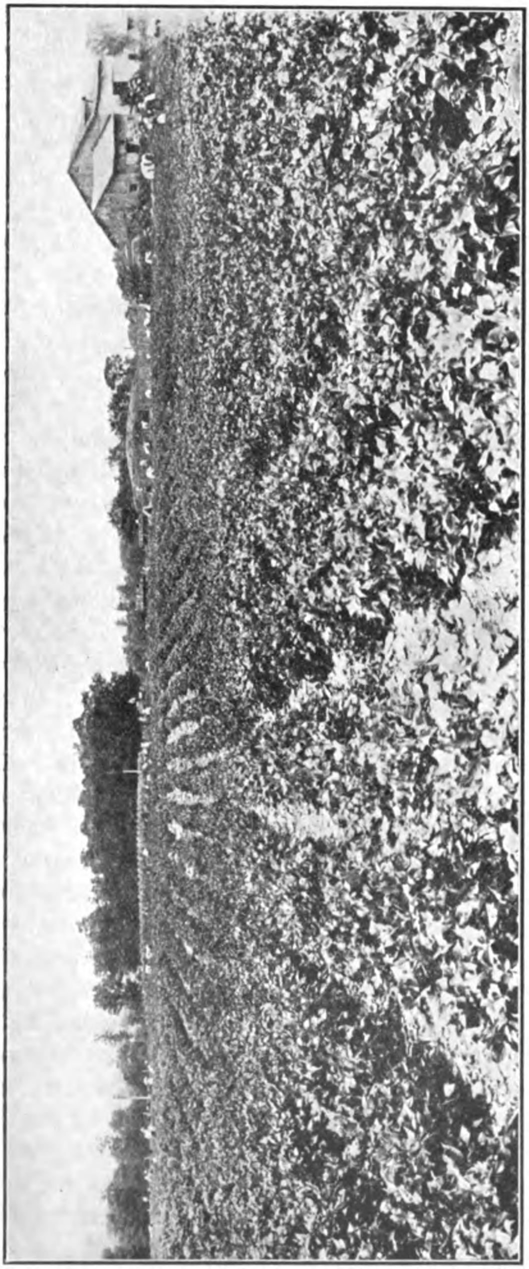

Fig. 5—Harvesting Field Beans from Broad Fields on Outwash Gravel Plain near Cortland, N. Y.

It would manifestly be impossible within the limits of this paper to consider this topic in full in its regional aspects. Several areas, however, have had their crop production so definitely determined by the typical sandy-gravelly nature of glacial outwash material as to merit special mention. In Maine, Ireland, Denmark and East Prussia glacial outwash features predominate, and on the sandy soils characteristic of such origin these regions produce potatoes in large quantities and in large yields per acre. To such a degree is this true that the dependence of the Irish and Germans on the potato for a chief food staple is proverbial. Latterly the sugar beet also has been very successfully grown on such soils, especially in Prussia. On the other hand, a large part (nearly one-sixth of the state) of the northern region of the southern peninsula of Michigan, comprising such sandy soils, formerly covered with great forests of white pine, have, since the complete cutting of the forest and the destruction of its humus floor, developed into infertile "pine barrens," at present practically worthless.

It would probably be difficult to demonstrate whether, on the whole, agriculturally similar regions within or without the glaciated areas have the more diversified soils. That the glacial soils, however, are sufficiently diversified in texture to afford possibilities for growing a wide range of products within narrow areal limits is clearly shown. Moreover, in the glaciated regions, the heavy soils, suitable for the heavy cereal crops, the staples of agriculture, predominate to a marked extent. As a matter of comparison it is, however, interesting to note that in the United States south of the glacial belt there are in the Coastal Plain Province highly diversified soils, mostly light in texture. Over the Piedmont Province the soil types are remarkably uniform, and this is true also of the soils of the limestone valleys of the Appalachians, as it is for the soils of the river flood plains. On the Appalachian plateau uplands and mountains the soils are more diversified, but of comparatively low agricultural value. Accordingly the valuable non-glacial soils in the United States east of the Mississippi seem to be predominatingly uniform in texture over large areas, though if all the different provinces are considered, a wide range in texture is encountered. On the other hand the soils of France are highly diversified in character within a comparatively small area.

(*d*) *Loessial Soils.* Although they are in general peripheral to the glaciated areas and have been included with the till sheet soils in the discussion of textural characteristics, the loessial soils de-

serve a special mention in this paper on account of their unique nature and high fertility. Their occurrence adjacent to the glaciated regions is probably due to wind transportation of the finer particles of material from wide areas of mud flats, alternately wet and dry, formed by slow-moving and aggrading waters from the glacier fronts; flowing in shallow floods during periods of melting and disappearing almost wholly at other times. Thus loess is spread over the valleys and adjacent uplands of northern France and Belgium, of central Germany, and, extending into Russia, forms the substratum of the famous *chernozem*, or black earth, region, which constitutes the great wheat growing section of that country, the areas that were invaded by the melting waters flowing away from the ice fronts. Similarly, in the United States the loess is found extending far to the south of the glaciated areas and bordering the Mississippi and Missouri Rivers, through whose basins enormous quantities of glacial waters must have flowed during the various stages of the ice advances and retreats.

In texture the loess is coarser than clay, but finer than the finest sand. Its origin in the humid agricultural areas adjacent to the glaciated areas is indicated by its mineral composition, which includes angular, undecomposed fragments of calcite, dolomite and feldspar, products of glacial grinding of a size available for wind transportation. Chemically the loessial soils are, therefore, very rich in lime and to this their great fertility when well watered may be, at least in part, ascribed as may also their enduring qualities. In the subhumid region of the United States it is the most valuable soil type. The loess-covered counties of eastern and southeastern Nebraska produce most of the corn, wheat, oats and alfalfa grown in the state and are the most fertile areas within its boundaries.

4. Effects on Agriculture due to Hydrographic Phenomena Resultant from Glaciation

(*a*) *Glacial Lakes and their Effects on Local Climates and Agriculture.* Areas invaded by the continental glaciers are significantly characterized by the large number of lakes and ponds which dot their surfaces. The typical glacial lake regions of Europe, Finland, southern Sweden and the Norwegian and Scottish fiords and lochs lie outside the agriculturally important areas and have, therefore, no important bearing on this discussion. Many of the larger bodies of water, notably the Great Lakes, of the glacial lake region of North America, however, lie well within the agricultural

province of the southern portion of the district. Over the whole district it has been computed that lake waters cover 16 per cent. of the surface[38] and this figure does not take account of many small lakes not represented on available maps. Therefore, since the larger lakes lie to the south, it is evident that an even larger percentage would need to be stated to express the relative extent of water and land within the agriculturally available portion of the district.

The importance of this as an effect of glaciation on agriculture is, from one standpoint, self-evident. If from 16 to 20 per cent. of the land is covered by water that much area is lost to crop production.

It does not follow, however, from this, that the total loss to agriculture may be measured by a similar percentage. It may even be true that the net result of the glacial creation of these lake basins represents a net agricultural gain, if transportation facilities are considered a factor. Certainly, also, their presence favorably influences the agriculture of the lands adjacent to them by modifying the climate and thus making possible the profitable production of crops which could otherwise not be successfully grown in the same latitude.

Where bodies of water of considerable area exist they exert an important equalizing effect on temperature. Water absorbs more heat, holds more heat, is warmed to greater depths, absorbs and radiates heat more slowly than land. Further, 50 per cent. of the insolation on water areas is used in evaporating water. This develops a moist blanket of air above and adjacent to the water surfaces that is less subject to marked temperature fluctuations than dry air. The total effect of these differences is to make summers cooler, winters warmer, to prolong the fall season and retard spring, and, also, to check sudden temperature changes in short time periods. This last is especially important in the northern belt of prevailing westerly winds with its alternation of cyclones and anticyclones, in which the glaciated regions are situated.

These effects are very clearly shown by a consideration of the climatic features of the state of Wisconsin as set forth in a bulletin recently published.[39] As a result of lake influence (and elevation difference) the length of the growing season, from the last killing frost in spring to the first killing frost in fall, averages 171 days for

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[38] Bowman, I.: Forest Physiography, 1911, p. 564.

[39] Whitson, A. R. and Baker, O. E.: The Climate of Wisconsin and its Relation to Agriculture, *Univ. of Wis. Agric. Expt. Sta. Bull. 223*, July, 1912, pp. 25–27, 44, 54, 64.

five stations along the Michigan shore, whereas for five interior stations at corresponding latitudes it averages only 130 days. As the altitude differences in Wisconsin are not great this relation may be ascribed primarily to the lake influence. The Lake Michigan shore section possesses the most equable climate of Wisconsin. Similarly, stations along the Lake Superior shore have an average growing season of 139 days, while those inland, though located farther south, average only 95 days; but here differences in elevation are probably more effective.

The long growing season and high mean summer temperature make tobacco production possible in the southeastern corner of the state, adjacent to Lake Michigan. Even more marked is the climatic influence of the lake on fruit raising. Thus the two Wisconsin peninsulas that project respectively into Lake Michigan and Lake Superior are now experiencing rapid horticultural development, producing apples, cherries, bush fruits, and even peaches. Inland, these crops are impossible or unsuccessful. In the case of the northern, Lake Superior peninsula, growers are warned that the planting of orchards more than three miles remote from the water influence must be regarded as an experiment. In the southern portion of the state, however, fruit growing has proved profitable in many inland areas where even a small lake, of which there are thousands, afforded local climatic protection.

While Wisconsin undoubtedly derives great agricultural benefit from the effect of the glacial lakes on her climate, yet the state is at a disadvantage in that it lies to the windward of the large bodies of water, Lakes Michigan and Superior. Michigan, New York and Ontario derive similar benefits in more marked degree because they lie to the east and south of adjacent large lakes. The southern peninsula of Michigan is peculiarly favored in that it lies between two large bodies of water, Lakes Michigan and Huron (Fig. 6). Here peaches are regularly ripened on a parallel that forms the northern boundary of Vermont. The climate over the whole area of Michigan is insular to a marked degree.[40]

In New York the areas to the south and east of Lakes Erie and Ontario constitute distinct, wide, climatic provinces[41] with longer growing seasons than more southerly parts of the state, and constitute the great apple, grape and nursery growing areas for which

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[40] Schneider, C. F., Michigan, in "Climatology of the United States", *Weather Bureau Bull.1*, p. 556, U. S. Dept. of Agric.

[41] Wilson, W. M.: Frosts in New York, *Cornell Univ. Agric Expt. Sta. of the College of Agric. Bull. 316*, p. 532, June, 1912.

the state is famous. In more restricted areas, adjacent to the narrow Finger Lakes of Central New York, the same climatic relations make possible the very successful growing of grapes. The province of Ontario owes in large part its great productiveness for general farming, nursery and fruit growing to the favorable influence of Lake Ontario on its climate. Fully 75 per cent. of all the fruit grown in Canada is produced in the peninsular Niagara district and in the southern part of the province of Ontario.

It must not be understood that, because the horticultural aspect

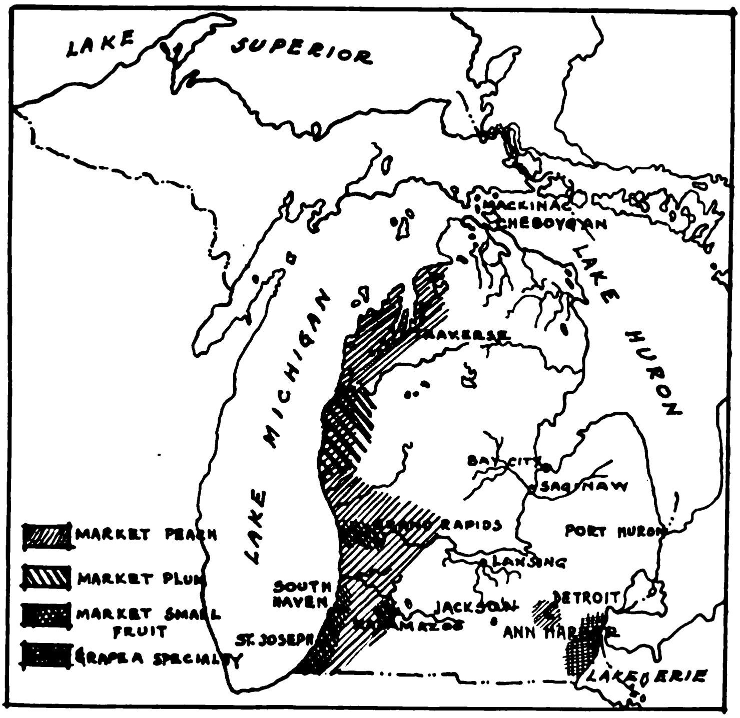

FIG. 6—Distribution of Fruit Crops in Southern Michigan. After W. W. Tracy in "Cyclopedia of American Horticulture," L. H. Bailey, Editor.

is emphasized in this discussion, fruit growing is the only phase of agriculture to which these lake districts are adapted. On the contrary, they produce abundant yields of many other crops. Fruit growing is, however, ordinarily, a precarious enterprise because of the great damage resulting from late or early frosts. For this reason it yields large profits in northern regions where the harvests can be depended on. Therefore, the agricultural value of these lands is

much increased by the equalizing influence of the glacial lakes on climate. Since unseasonable frosts damage other crops as well as fruit, the climatic conditions for these are made more favorable also, and where the modifying factor may not be great enough to protect fruit it may serve to save, in many instances, the hardier crops.

(*b*) *Agricultural Relations of Deposits in Drained and Filled Lake Basins.* The Great Lakes and their forerunners, the pro-glacial lakes margining the ice on its retreat, formerly extended over much larger areas than they do at present. Thus many acres of land surface in the glaciated area of North America (and also of Europe) are covered with deposits laid down in these lakes. In addition to such extensions of present lakes, there were also large areas, temporarily occupied by lake waters during the retreat of the ice, which were drained, after the ice barrier that prevented drainage to the northward, had melted away. Of these, the former Lake Agassiz, in the basin of the Red River of the North (North Dakota, Minnesota and Manitoba) is the most notable. Further innumerable smaller lakes and ponds that existed at the close of the glacial period have since been filled or drained by natural processes; in addition to the many others that have been reclaimed by drainage operations. In Minnesota it is said that there are 8,000 lakes large and small, and that one-half of these will be destroyed by natural processes within the next fifty years. Similarly in Connecticut of an estimated number of 4,000 lakes that existed after the glacial period some 2,500 have been obliterated.[42]

On the bottoms of these former lakes various kinds of deposits accumulated. While the ice was withdrawing and immediately after its withdrawal, streams flowing into such lakes carried large quantities of sediment, because the freshly accumulated glacial deposits lacked a vegetation cover and were easily eroded, and because great quantities of material were brought by streams outflowing from the ice itself. Therefore, in shallow bodies of water in which currents were readily set up, clays and silts were deposited often over large areas. The effects of this, as bearing on agriculture, was twofold. The previously existing lake bottom topography was leveled up, since the fine grained material tended to accumulate in hollows, because the water was more quiet in these, and because material which settled on slopes occupied unstable positions and tended to slump. This latter effect has been observed by the

42 Salisbury, Barrows and Tower: Elements of Geography, New York, 1912, p. 400.

writer in recently drained glacial lakes in Alaska, and is also apparent on the slopes of deeper lakes in the regions invaded by the continental glaciers whose hollows were not completely filled before the water was drained off. On the bottoms of the shallower lakes perfectly level plains were developed in this manner. The material deposited was thick, of fine texture, and, except for an occasional erratic dropped by a drifting iceberg, absolutely free of stones. The effects of postglacial weathering and of accumulation of humus from material plant growth, with consequent development of friability, on the surface layers of such deposits, resulted in the creation of a soil of extraordinary agricultural utility.

The floor of former Lake Agassiz previously mentioned, extending over an area of 110,000 square miles (larger than that covered by all the present Great Lakes) is of this character. Much of its expanse is as level as the surface of a calm sea. Furrows miles long may be plowed in deep, rich soil; producing a fine grade of hard wheat. Since 1870, and even now, this region is being developed by a great surge of farming people, attracted from all parts of the United States by its exceptional agricultural possibilities.

The levelness, depth and uniform texture of this soil makes it susceptible of cultivation by machinery on a large scale. As a result of this, and, also, because of the only slightly lesser adaptation of the level glacial till plains to such machine cultivation, the labor cost of grain production has been greatly decreased in modern times. Though areas outside the glaciated regions also offer opportunities for the use of labor saving machines in agricultural operations, yet the glaciated regions, inasmuch as they are the grain producing sections of the northern hemisphere, are largely to be credited for having effected this saving in the cost of our food supply. How much this saving in labor costs amounts to is not generally appreciated. Between 1858 and 1894 the total labor cost of producing a bushel of corn was reduced from 41 cents to 17 cents by this means. Similarly between 1830 and 1896 the total labor cost of producing a bushel of wheat was reduced from 20 cents to less than 6 cents.[43] This increased effectiveness of labor, made possible in large part by the level topography and depth of glacial soils, especially those on glacial lake plains, means a greater food supply at the same cost to offset the rise in population num-

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[43] Holmes, G. K.: Agricultural Production and Prices, *U. S. Dept. of Agric. Year Book, 1897*, pp. 600–601. This paper contains many other similar interesting schedules for various crops.

bers, as the soil can be cultivated more intensively, with higher returns per acre, without the necessity of increasing the number of individuals engaged in agriculture.

On the more porous, well-drained soils, margining the former extension of the Great Lakes, are located in large part the fruit growing areas noted in the paragraphs on climatic relations. These areas represent the beaches and wave-worked material along the former shores.

The smaller lake areas were more commonly filled by vegetation growth. This applies also to lakes and ponds which have been reclaimed by man. These smaller basins are almost all morainic hollows or dammed river valleys. Their drainage basins are relatively small, consequently no great amount of sediment was poured into them immediately after the glacial period. As they often constitute relatively deep pockets with no outlets they are characteristically susceptible to late and early frosts, because cold air, as it forms on the slopes, slides down and accumulates in such hollows. Furthermore, the thick covering of marsh grasses that naturally cloaks their level swampy surfaces prevents the sun's heat from getting to and warming the soil.

While such vegetation-filled, glacial lakes, when drained, have, as a rule, deep rich, black muck soils, this is not always the case. Frequently the organic deposits have not decomposed to the humus stage, are peaty in character, acid and deficient in mineral elements. To make such land available for agriculture requires application of lime. An interesting coincidence is that deposits of lime, in the shape of marl, often occur on the borders or under the vegetable deposits of such lakes and are thus most conveniently available for use on the area.

When skillfully treated such reclaimed muck lands yield most abundant returns in truck crops. Many of the most productive market gardens around the cities of the glaciated regions are on such soils. As instances, those around Chicago, Detroit and Port Huron may be cited. Celery, especially, is an extremely profitable crop on such lands, because it is a truck crop that may be stored and shipped to distant markets. Thousands of acres of these vegetation-filled lake basins still remain to be reclaimed. Because they have not yet been utilized the presence of these areas is not to be considered as a detrimental result of glaciation on agriculture. What they may be worth in the future is well illustrated by the data of one little reclamation project in central New York at Spencer Summit, south of Ithaca. Here 103 acres of marsh land,

a filled morainic lake basin, were purchased at a cost of $10.00 per acre. At a total expenditure of $3,100 this land was drained. A large portion of it was found to be underlain by marl. At an expenditure of about $11 per week it can be kept drained.[44] Celery, onions and lettuce will be grown. Similar land near Rochester, N. Y., is valued at from $300 to $1,000 per acre. Planted to celery this land will yield returns justifying its valuation at $245 per acre. Thus, by an expenditure of some $3,000, land worth $1,030 has been raised in value to $25,000. While this extraordinary increase is in part due to favorable location, with respect to shipping facilities, and to the low cost of the drainage operations, there is no doubt that a relatively great rise in land value will result from the drainage of many thousands of similar areas, still unreclaimed.

5. Summary

(*a*) Comparisons of the agricultural status of adjacent regions within and without the glaciated regions, whether between broad areas or smaller next adjacent sections, show a consistently higher development in the glaciated regions of dominant drift accumulation.

(*b*) Regions of predominant glacial erosion, whose agricultural value was impaired by such action, are climatically or topographically unfit for agricultural development of high order. They are best adapted for a forest crop, and for this sufficient soil remained or has accumulated since glaciation.

(*c*) In regions of very diverse rock structure, along contact lines of igneous and sedimentary rocks and in regions of bold relief, ice erosion resulted in a steepening of valley slopes and the carving of rock basins, giving rise to lakes. The steepened slopes are generally not cultivable, but as a rule support forest growth. They are, also, a detriment to agricultural transportation. In large measure such steepening of valley slopes is, however, compensated for by erosional widening and drift-deposit leveling of valley floors. The formation of lake basins, on the other hand, made large areas unavailable for agriculture. The irregular topography and in some instances the stony material of well-developed morainic ridges are adverse to their agricultural use, as is also the poor air drainage of the intervening hollows. Moraines and other

44 Data from man in charge.

drift deposits of such strong expression are not, however, of great areal extent.

(*d*) The extensive leveling, both by glacial erosion and drift deposit, of the minor rugosities characteristic of the normal, mature stage of development of preglacial relief constitutes an extremely favorable influence on agriculture resultant from ice invasion. Flat, upland, interstream areas may in some instances have suffered by modification of relief, in that their residual soils were eroded and only thin, stony soils left in their place by the ice.

(*e*) The average great thickness of the drift deposits and their level topography conserve the ground water supply of the glaciated regions.

(*f*) Glacial soils are more fertile than non-glacial soils; in part because they contain a higher percentage of the soluble mineral plant foods. Great commingling of different rock materials in glacial soils gives more uniform composition and fertility to them than is characteristic of sedentary soils. The level topography of glacial drift plains soils resulted in a deep accumulation of organic matter, which contributes much to their agricultural worth. The dominant textural quality of glacial soils is that best adapted to the production of the staple food crops.

(*g*) The deposits of the younger glaciations which cover the larger part of the ice invaded regions of central North America have a greater crop productivity than the older glacial soils.

(*h*) Owing to the wide variety of conditions attending the deposition of glacial drift, many textural soil types occur in the glaciated regions, providing for diversified and intensive farming within narrow areal limits. The more valuable non-glacial soils are quite apt to be uniform in texture over wide areas.

(*i*) Loessial soils extend the favorable influence on agriculture, due to glaciation, beyond the limits of the ice advances. Some of the non-glaciated areas would probably show even more marked agricultural deficiency, as compared with the glaciated regions, if these loessial soils were not present.

(*j*) In the humid agricultural section of eastern North America from 16 to 20 per cent. of the glaciated areas is unavailable for agriculture because submerged under glacial lake waters. This loss is offset, perhaps in very large measure, by the modifying in-

fluence of such bodies of water on climate. This climatic protection especially favors the production of valuable fruit crops.

(*k*) The level topography, uniform soil texture, the deep humus cover, and often the great areal extent of deposits on drained and filled glacial lake basins affords a soil of great fertility and very susceptible to cultivation by mechanical power. By such utilization of machinery on these areas and, also, on the level till plains, the labor cost of grain production has been very materially reduced. In conjunction with the muck deposits, characteristic of the filled basins of the smaller glacial lakes, are often found marl deposits. These may be used to advantage to correct possible acidity in the muck, in which very profitable crops of vegetables may then be grown.

6. Conclusions

The beneficial effects on agriculture, due to glaciation, are of wide variety and apparently outweigh detrimental influences due to the same cause. As a net result, glaciated lands are, therefore, of greater agricultural value and utility than non-glaciated areas under otherwise essentially similar conditions. It is not feasible, however, to state numerically the order of this difference, because too many unwarranted assumptions would need to be made.

CAPTAIN KOCH'S CROSSING OF GREENLAND*

In July, 1912, the expedition consisting of Captain J. P. Koch of Copenhagen, the German Dr. Wegener, the Icelander Vigfus Sigurdsson, and the Dane Larsen, landed at Danmark Harbor on the east coast of Greenland. Thirteen of the sixteen small Iceland horses brought along by the expedition ran away immediately after landing, and Wegener and Vigfus rode off with the remaining horses to find them. They were lucky enough to capture ten. Captain Koch and Larsen were engaged in landing the twenty tons of supplies which the expedition carried. This work was done with the aid of a motor boat and was accomplished with great difficulty, the anchor being lost and the propeller broken during the operation.

Later, in August, the transit became more difficult, the ice closing in on the boat, holding her fast for twelve days, breaking the keel and rudder and eventually sinking the boat itself. Then ice formed and the expedition was obliged to wait three weeks before the ice was strong enough to bear the horses and large sledges. While reconnoitering the Brede Glacier, Dr. Wegener fell and broke a rib. After a few days, however, he was up again and able to participate in the work, and when, on October 13, the expedition settled down for the winter, he had quite recovered.

In order to reach Queen Louise Land, where the expedition intended to winter, it was necessary to build a bridge crossing five crevasses and to cut a passage in an ice wall 130 feet high. On the night of Sept. 30, however, the glacier "calved" and a block of ice a third of a mile wide fell into the fiord on both sides of the spot where the expedition had camped with its horses and supplies. The result was that half of the supplies were destroyed and the newly built bridges were carried away and the driveway was rendered impassable. The men and horses, however, were not injured and, when the ice had finished its movement, the supplies were recovered. It was nevertheless necessary to rebuild the bridges and driveway before the expedition could think of going forward.

In attempting to reach Queen Louise Land, four of the seven

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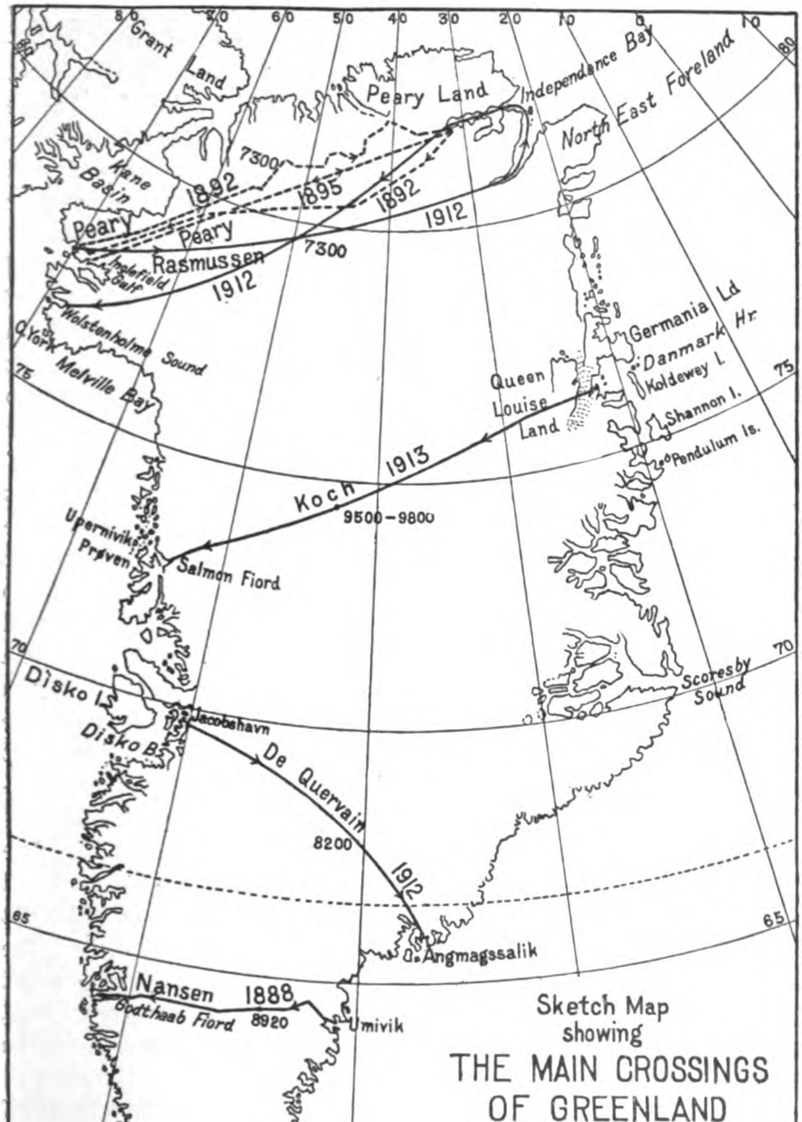
* The Society is indebted to the Hon. Maurice F. Egan, American Minister at Copenhagen, for this summary of a translation of Captain Koch's report of his crossing of the inland ice of Greenland at its widest part from Denmark Harbor on the East Coast to Prōven on the West Coast.



N.B.—The maximum altitudes of the ice cap along the routes are indicated in feet.

sledges were seriously damaged and Captain Koch finally gave up the attempt and established winter quarters at a place called "Storstrømming," nine miles east of the center of Queen Louise Land. It was necessary to erect the house on the inland ice itself. All the horses except five were killed and their meat was used for the purpose of sustaining the remainder. From this time until the end of October, the expedition endeavored in vain to discover a better way to Queen Louise Land.

Captain Koch then had the ill-fortune to experience a second mishap, which he describes as follows: "We had the intention of making a new attempt in November, when the first full moon came, but before that time I fell off an ice wall about fifty feet high and broke my right leg. For three months I was confined to my bed and we could not proceed until March."

The winter was passed quietly. The temperature was –58° Fahr., but did no harm; and, on March 5, 1913, the expedition set out on horseback for Queen Louise Land, covering twenty-five miles in ten hours—the temperature being –40° Fahr. Then at last a sledge road was found that was passable. From March 4 to April 14 the expedition explored Queen Louise Land with the aid of sledges. Then Larsen fell from a snow bridge while crossing a river bed and injured his foot. However, he was almost well again when the expedition, on April 20, left its winter quarters on the long journey, 700 miles or more, across Greenland to the west coast. Captain Koch reports that at that time all the other members of the party were well and in good condition for the march.

Travel over the inland ice was extremely difficult. During the first forty days the party had only two days of fine weather and were obliged to stop for twelve days on account of blizzards. It was often necessary to travel against a wind of high velocity. The horses became exhausted and snow-blind and three of the five had to be killed. The men themselves stood the journey very well, notwithstanding the strong wind and the low temperature. In spite of daily frostbites no permanent injury resulted.

In central Greenland the expedition reached an elevation of 8,200 to 9,850 feet above the sea. The low atmospheric pressure in this region told upon the men and the horses, causing frequent exhaustion. The reflection of the snow was more troublesome, however, than anything else. Everyone suffered from skin peeling from the face and, as the temperature during June frequently went down to –22° and –29.20° Fahr., large wounds appeared on the men's faces. Arctic cramps were often very troublesome.

As the snow was very uneven, the sledges were frequently upset. Later, the snow became so loose that the horses had to be provided with snow shoes. In spite of this precaution they became very much exhausted owing to the poor food. On June 11, one of the two remaining ones had to be killed. At this time the party, having arrived at a place where the land sloped to the west, joined in hauling with the horse in the hope of retaining this last animal, which seemed indefatigable and to which all the members of the party were very much attached. The daylight marches increased in length.

On July 2, they sighted ice-free land, the first they had seen since May 16. But now the temperature rose very suddenly and the expedition emerged directly from the winter of the inland ice to the summer of the coast. At the same time new difficulties arose, the melting snow creating innumerable small lakes connected by deep streams, which rendered impassable for horses the way to the depot, which had been planted for the expedition in 1911. "Therefore," says Koch, "we were obliged to kill our last horse, our good friend in need, after it had traveled with us nearly 700 miles across Greenland, and was then only seven miles from green pastures."

As it was impossible to cross the Salmon [Lakse] Fiord without some special appliances, the expedition constructed from sledges and the covers of their bedding a ferry, which it became necessary to carry a distance of twelve miles to the Salmon Fiord. In carrying out this work the members of the party took with them provisions for five days, but no tents, sleeping bags, or anything else with which to protect themselves.

On July 11, they crossed the Salmon Fiord and proceeded toward Prøven. On the 13th they reached the peninsula Kangek, about twenty miles from Prøven, and were detained by rain, fog and snow. They built a cover after the Eskimo fashion, of rocks and moss and lay there for thirty-five hours without food, their last provisions having been exhausted. The weather cleared on the 16th, and the party desired to proceed, but were prevented by exhaustion brought on by hunger, cold and exposure. A difficult piece of territory covered with deep snow lay in their path and prevented further progress. They thereupon killed their dog that had traveled with them across the inland ice, cooked the meat and were about to eat it, when they discovered a sailing vessel in the fiord off Prøven. They signaled the boat by means of firing and were fortunately heard by those on board. The boat, which be-

longed to the Rev. Mr. Chemnitz of Upernivik, thereupon put in and took the party aboard.

The latter part of Captain Koch's report tells of the scientific results of the expedition. The chart of the district west of Danmark Harbor was completed and a rather extended knowledge of the interior of the country, its topography, vegetation and animal life was acquired. The most important parts of Queen Louise Land were surveyed and records of temperature were obtained, with the result that new light has been thrown upon certain natural phenomena heretofore unexplained.

The manner of movement and interior structure of the glaciers were examined and determined by means of many photographs. A large number of meteorological observations were made, which will serve as the foundation for further study. Fata Morganas were for the first time photographed by means of a special telescopic camera. The aurora borealis was photographed with a cinematographic objective after the method of Professor Stoermer. A special study was made of the polarization of the atmosphere and, during the passage across the inland ice, the light or reflecting capacity of the snow was measured. The rainbow was studied at temperatures as low as —30° Fahr. Observations of this sort have never been made before at a temperature lower than —7.6° Fahr. The results prove that the arctic mists consist of undercooled water and not of ice crystals. In addition, a series of photographs and of stereoscopic micro-photographs of the rime-crystals were taken.

Captain Koch says that, while the scientific work was concentrated on a comparatively few matters, the observations on these were very thorough. He also mentions the fact that he found traces of snow sparrows and of polar foxes in the center of Greenland, at more than 300 miles from the nearest exposed land.

JOINT MEETING OF THE AMERICAN GEOGRAPHICAL SOCIETY AND THE ASSOCIATION OF AMERICAN GEOGRAPHERS

These societies held their first joint meeting in this city on Friday and Saturday, April 3 and 4, 1914. The meeting was most successful in attendance and in scientific and social interest. Nearly one-half of the members of the Association were present, which is remarkable considering that many of them live in the central and western parts of the Union and their annual meeting was held at Princeton, N. J., only three months earlier. The entire house of the Society was thrown open to the visiting members of the Association who were also our guests at the Park Avenue Hotel and at two mid-day luncheons. A large number of maps, especially arranged for the inspection of the visitors, included specimens of the topographic survey sheets issued by all the governments producing them; also notable recent maps mentioned in the Geographical Record (p. 365) in the notice of the latest exhibition the Society has arranged for the public.

Vice-President John Greenough welcomed the Association at the opening session on Friday morning with the following remarks:

"*Gentlemen of the Association of American Geographers:* It is a matter of great regret to our President, Mr. Archer Huntington, that absence from the city prevents him from receiving you here to-day, and it, therefore, devolves upon me as Chairman of the Council to bid you welcome on behalf the American Geographical Society to our modest home. We trust that this meeting—the first of the annual gatherings proposed under the treaty between our respective organizations—may prove to be the initial step in an enduring coöperation for the promotion of geographic knowledge and effort in this city and elsewhere. I am aware that in addressing you I speak to a body of gentlemen who have already achieved distinction in the field of science where our own members can claim at best only to be students and scholars; and I should, therefore, not attempt in any case to take part in your scientific discussions.

"But it has seemed to me that it would not be thought out of place if I state with frankness what advantages we hope to contribute and what to receive in the *quasi* alliance between us. We may claim, I think, that our Society's aims are absolutely altruistic and free from any possible influence of personal exploitation in the administration of the valuable plant and resources which the generosity of many benefactors has entrusted to us. Our desire is to make of these implements the best use possible in the cause of education in the science to which all of us present are devoted. We possess here a building fitted for the use of literary workers, with a reference library of nearly 50,000 books and 30,000 maps, whilst the labors of an efficient and zealous staff are directed to increase and improve these facilities and to keep in touch with kindred societies throughout the world. You gentlemen of the Association possess experience and attainments which we feel may be of great use to us in realizing the aspiration to which I have alluded and I avail myself of this occasion to express the earnest wish of our Society that you will not regard the limitations of the agreement between us as defining completely our relations,

but that you will favor us with suggestions if at any time we can be of service to you in any manner whatever, or if action or endeavor on our part in any direction may be of advantage to the cause of geographic science.

"Some suggestion in this direction has already presented itself in an informal consideration of the possible value of a concerted inquiry into the methods of geographic instruction in the schools, and in time to come we should like to hope that similar efforts for the general advantage might crystallize and take shape through our mutual relations. In these very brief and crude remarks you will readily gather that I am endeavoring to outline the spirit and not the form which we invoke for our future. We have had already abundant reason for assurance that we have not misinterpreted a similar cordial feeling on your part, and we have already taken advantage of it to seek guidance not long since in matters that concerned us, receiving valuable advice which this is a suitable place to acknowledge.

"And now in conclusion I may be permitted to add a word regarding our own field of effort and accomplishment. Working in the great metropolis of commerce and finance we are bound to be confronted with the fact of many material considerations which tend to engross the attention of local residents to the exclusion of other considerations. But, notwithstanding this condition, there is to be seen on every side evidence that a spirit of idealism does exist in this community, which finds expression in widespread support of every form of endeavor for human uplift and ethical or intellectual development. In our own organization for instance we number some 1,150 Fellows, who loyally second the plans of their Council to afford a suitable nucleus around which may gather any and all affiliated interests or material which present themselves in this city. Our scheme of influence includes facilities for study, lectures, publication and correspondence. In this unambitious, but, as we think, useful rôle we have continued for sixty years, and we are encouraged by evidences of appreciation in the necessarily restricted circle devoted to our theme. Among the most gratifying incidents of our recent experience, we are glad to record the agreement with your learned and active organization, which opens, as we hope, a path of extended coöperation accompanied by increasing usefulness and mutual respect.

"Welcome gentlemen to our dwelling and to our city. We do not own the latter, but we venture the invitation, for in spite of all its failings, this is conceded to be a hospitable and open town!"

Professor Charles R. Dryer, Vice-President of the Association of American Geographers, responded as follows:

"*Mr. President:* In behalf of the Association of American Geographers, I wish to return hearty thanks for the generous welcome which you have just given us. We would all like to express directly and personally our appreciation of your hospitality and our sense of the good fortune which you are bringing us to-day. This seems to me something like a week-end house party, to which are thrown open all the resources of a great mansion and estate, provided especially for us by the solicitous care of our hosts. I have now enjoyed the hospitality of the American Geographical Society for a longer period than most of my colleagues. I know whereof I speak when I say that it means boundless privilege and unremitting attention.

"I am sure that we all feel a sense of pride and satisfaction in that we

meet to-day in this home of geography. Here our science is not the vassal of geology, history or commerce, but an independent, sovereign state. Here we geographers are not visiting our cousins or our aunts. We are not poor relations from the country or rich relations from the city, but we are sons foregathering from afar in the house of the great mother. We feel as though we were youngsters receiving the paternal blessing and presently to be sent out with a Godspeed and an assurance of substantial backing in our efforts to live up to the measure of our opportunities. I am sure it is a serious question with every one of us what we are going to do to justify the confidence placed in us.

"Geography has need of men and women who will devote all their energies to her scientific and academic advancement, and will have little time to make money. She has need also of men and women, who, occupied with other and large affairs, are yet willing to give her a generous share of their ability and means. We have here today a company composed of both sorts working in harmonious coöperation. No event could be more auspicious for the future of our science. I believe that this meeting marks the beginning of a new era of great undertakings and accomplishments in American geography. That it is a reality and not a dream, we gladly yield to the American Geographical Society full credit, and to you, Sir, again with one accord, thanks."

The audiences at the three sessions in our lecture hall on Friday morning, Friday afternoon and Saturday morning included a considerable number of professors and students from Columbia and New York Universities and Barnard College. The following papers were read at these sessions, all illustrated:

W. H. HOBBS: Land Sculpturing in Arid Lands with Observations from Northeastern Africa.

T. WAYLAND VAUGHAN: The Platforms of Barrier Coral Reefs.

D. W. JOHNSON: Botanical Phenomena and the Problem of Coastal Subsidence.

E. W. SHAW: Characteristics of the Mississippi Delta in the Light of Comparative Studies of Some Old-World Deltas.

OLIVER L. FASSIG: The Period of Safe Plant Growth in Maryland and Delaware.

FREDERICK J. TURNER: Geographic Influences in American Political History.

J. RUSSELL SMITH: The Tree as a Factor in Man's Adjustment to Hilly and Rocky Land.

W. W. ATWOOD: Over the San Juan Mountains to the Ancient Cliff Dwellings of the Mesa Verde.

COLLIER COBB: The Forest of Sunburst: A Study in Anthropogeography.

The audience at the lecture in the Engineering Societies' Hall on Friday evening by Dr. L. A. Bauer, Director of the Department of Terrestrial Magnetism, Carnegie Institution, Washington, included many Fellows of the Society. Dr. Bauer spoke on "The General Magnetic Survey of the Earth," including an account of the work of the non-magnetic yacht *Carnegie* and of the various land expeditions dispatched to many parts of the world. Abstracts of the papers will be published in the *Bulletin* for June and one or more of the papers may appear in these pages later.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

The Cullum Geographical Medal Presented to Miss Ellen Churchill Semple. At the meeting of the Society in Engineering Societies' Hall, on March 24, the Cullum Geographical Medal was presented to Miss Semple in the presence of an audience that filled the large auditorium. In presenting the medal, Vice-President Greenough said:

"LADIES AND GENTLEMEN: It becomes now my pleasing privilege, in your name, to bestow the Society's gold medal of honor upon a distinguished recipient. The science of geography was construed for a long period in a narrow sense, as confined solely to the topographical characteristics of the earth, and the title of geographer was regarded as synonymous with discoverer or explorer. But in time a broader significance was accorded to the term and, in like manner, as the interpreter of hieroglyphics is held in no less honor than their finder, so the function of the geographer was extended to embrace a study of all accessories of physical environment and their meaning. Thereupon its phase of first importance and greatest dignity becomes as indicated in the words of the poet, The proper study of mankind is man. This phrase I take it may be regarded as defining the field of anthropogeography which concerns itself with the inquiry how humanity is affected by the geographical conditions surrounding it in each instance. To this branch of science the medalist has devoted herself for many years and in many lands with a result truly monumental. Her writings and teachings on the subject are recognized both here and in Europe as authoritative and exhaustive and the charm of style and manner in her books creates a sustained interest such as might not always be expected in scientific material. The catalogue of her works is extensive and our Society honors itself in honoring her. I will read the legend on the medal, which is necessarily brief:

"'Awarded to Ellen Churchill Semple in recognition of her distinguished contributions to the science of anthropogeography. 1914.'

"And now, Miss Semple, I ask your acceptance from our Society of this medal. Its inscription is intended as an enduring memorial to your scientific attainments, but I must be permitted on behalf of your many friends to add that it is accompanied by an unwritten appreciation of your personal character, which they all cherish in their hearts."

Miss Semple responded as follows:

"MR. PRESIDENT, LADIES AND GENTLEMEN OF THE AMERICAN GEOGRAPHICAL SOCIETY: I am deeply sensible of the rare and signal honor which you have conferred upon me. The honor is all the greater because of the high standing and high standards of the gentlemen who constitute the Council of your Society, and also because of the distinguished names associated with this medal in the person of its former recipients. The award comes to me as something so unexpected and inexplicable, that it has revived my childhood faith in miracles, and in an instant wiped out all the effects of a perfectly good scientific education. To the research student, absorbed in investigation, his work is so great that it seems to fill the world; his task when accomplished seems so small an achievement that he deems it scarce worthy of comment, much less such recognition as this. Therefore, out of the idealism of the scholar and out of the humility of the worker I speak to you my thanks for your approval and encouragement."

The following named persons, recommended by the Council, were elected to Fellowship:

Cyr. Van Overbergh, Brussels, Belgium,
W. J. Turner Lynch, Larchmont, N. Y.,
Dexter Parshall Cooper, Stamford, Conn.,
Miss Maria Bowen Chapin, New York,
Michael P. Grace, New York,
Outerbridge Horsey, New York,
Myron Reynolds, New York,
Miss Virginia M. Whitfield, New York.

The Hon. George H. Moses, A.M., recently United States Minister to Greece and Montenegro, then addressed the audience on "Greece: The Old and the New." Lantern views were shown.

The Daly Medal Awarded to Prof Albrecht Penck. The Charles P. Daly Medal for Geographical Research has been awarded by the Council to Dr. Penck, Professor of Geography at the University of Berlin. The medal has been forwarded to that city where, on behalf of the Society, it will be presented to Dr. Penck by the Hon. James W. Gerard, Ambassador of the United States to Germany.

The Society's Exhibitions. Among the new exhibits on the racks in our Lecture Hall are collections of views of Constantinople and Bermuda, and a selection of modern maps and atlas sheets each distinctive in its field. They include maps of parts of Asia and Africa published by the British, French, German, Japanese and Russian War Offices; the sheets so far published of the International Map of the World; examples of route surveys; recent maps of the oceans; recent noteworthy economic and anthropogeographic maps; and a series of physical maps of the continents.

The Society's exhibitions are open to the general public from 10 A. M. to 5 P. M. on week days and from 2 to 5 P. M. on Sundays.

Legacy to the Society. The late Hermann C. von Post, whose long and valued services to the American Geographical Society as one of its Fellows and a member of its Council were referred to in the *Bulletin's* notice of his death (January, 1914, p. 54), left the Society a legacy of $10,000.

NORTH AMERICA

New York State Board of Geographic Names. A law was passed on April 23, 1913, by the legislature of New York (Chapter 187, amending Article 10 of Chapter 23 of the laws of 1909 and designated Section 110) creating a board to pass on the correct form of all geographical names within the state. For the copy of this law reprinted below the Society is indebted to Dr. John M. Clarke, state geologist and secretary and executive officer of the board.

110. Board of Geographic Names; Powers and Duties. A state board of geographic names is hereby created, to consist of five members, of which the commissioner of education and the state geologist shall be ex-officio members, and three of whom shall be appointed by the governor to hold for terms of two, four and six years, to be designated by him when the appointments are made. Their successors shall be appointed by the governor for terms of six years. Vacancies shall be filled by the governor for the unexpired terms of the offices vacated. The state geologist shall be the secretary and executive officer of such board. All of such members shall serve without compensation. The said board shall have power, and it shall be its duty:

1. To determine and establish the correct historical and etymological form of the place names in this state and to recommend the adoption of such correct forms for public use.
2. To determine the form and propriety of new place names proposed for general use, and no corporation, individual or community shall introduce such new place names without the consent and approval of this board.
3. To coöperate with the United States board of geographic names and with the United States post-office department in establishing a proper, correct and historically accurate form for all place names proposed as designations of new post-offices.

Mississippi Floods. In a monograph on the Mississippi floods of 1912 (The Ohio and Mississippi Floods of 1912, by H. C. Frankenfield, *Bulletin Y*, U. S. Dept. of Agric., Weather Bureau, Wash. 1913), Professor Frankenfield discusses the relative importance of four great floods, those of 1882, 1897, 1903 and 1912. He arrives at the conclusion that in amount of rainfall the 1882 flood exceeded the others, but in stage of river and in duration above flood

stage the 1912 excelled. In striking the balance of these, he assigns the first place in the flood history of the Lower Mississippi valley to the flood of 1912. It is a question whether any value can be placed upon this conclusion. Stage of river and flood duration during the flood of 1912 was measured under different conditions from those of earlier floods as a result of the constant growth of levees and the impounding of the waters so that it may be expected that floods of less rainfall may in late years exceed in these particulars floods of more rainfall of early years. The amount of precipitation must be a main factor in estimating floods, and with this the conditions affecting run-off is a safer guide, so long as the character of the high water trough is changing, than stage or duration. The *Bulletin* contains a clear statement of property losses during the flood, and includes forty-one diagrams and charts illustrating the climatic conditions and the water stages during the four floods.

ROBERT M. BROWN.

The Second Ascent of Mt. Robson. On July 31, 1913, Conrad Kain, a Swiss guide in the employ of the Alpine Club of Canada, with Mr. W. W. Foster, Deputy Minister for Public Works, British Columbia, and Mr. A. H. MacCarthy, made the second ascent of Mt. Robson. The first ascent by the Rev. George Kinney was described in the *Bulletin* (Vol. 42, 1910, pp. 496-511). Mr. Kain, writing of his ascent (*Alpine Journal*, No. 203, Vol. 28, 1914, pp. 35-38) describes the summit as "nothing but two big cornices of snow meeting at an angle." The view, he says, is very fine but, as experienced mountain climbers know, one can never expect the best view from such a height. The temperature he thinks must have been below zero. He adds that the snow conditions on the highest peaks in the Canadian Rockies can never be compared with those in the Alps as there are more avalanches in the Rockies on account of the dryness of the atmosphere which leaves the snow powdery and unpacked. Mt. Robson, he thinks, will always be a risky climb, even on the easiest side, on account of avalanches.

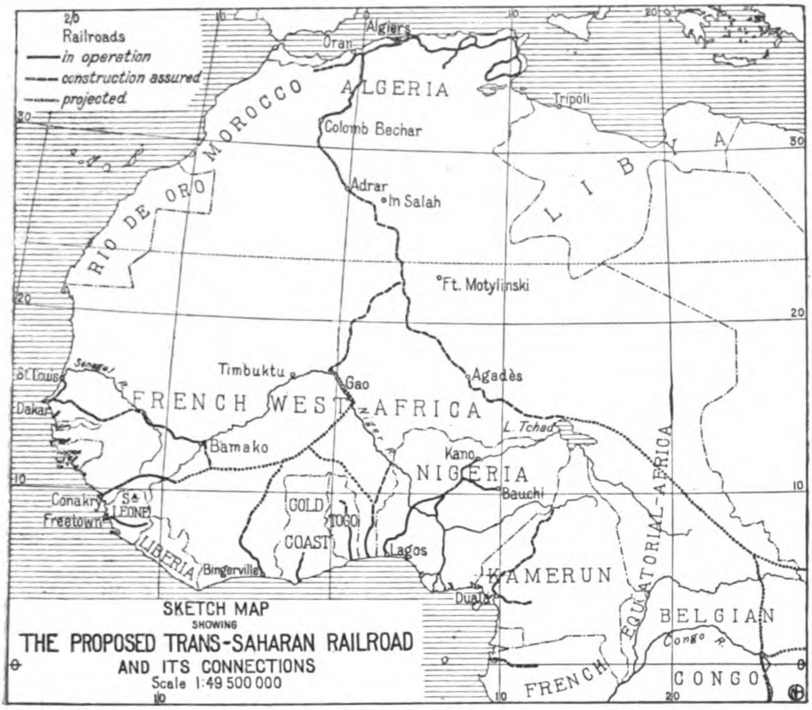
Mr. Stefansson Honored by the American Museum of Natural History. Mr. Vilhjálmur Stefansson, in recognition of the important explorations that he has carried on and his contributions to the sciences of geography and ethnology, has recently been made an Honorary Fellow by the Trustees of the American Museum of Natural History. This is the highest honor that it is within the power of the Museum to bestow and has been awarded to but seven other persons during the history of the institution.

International Ice Patrol Service. The United States Revenue Cutter *Seneca* is carrying on the international ice observation and ice patrol service provided for by the recent London conference. The *Seneca* left New York on Feb. 19, proceeding toward the east of Newfoundland, locating ice fields and icebergs, observing the quantities, kind, extent and drift of the ice and obtaining other information that may be of value. The object of the patrol is primarily to ascertain the location and progressive movement of the limiting lines of the areas in which icebergs and field ice exist in the neighborhood of the Grand Banks and the dissemination of this information for the guidance and warning of navigators. The service also includes such oceanographical and meteorological observations as may help to explain the causes that determine the position and extent of the ice. The *Seneca* endeavors to send a daily message to the coast radio stations for distribution, and also to keep ships at sea advised by daily radio messages of the limits of the ice fields, etc. (*Hydrogr. Bull. No. 1281,* March 18, 1914).

AFRICA

Results of the French Transafrican Railroad Mission. A party of French officers led by Captain J. Nieger spent ten months from Jan. 17 to Nov. 18, 1912, in preliminary surveys for a railroad intended to connect southern Algeria with the Lake Chad district and the central valley of the Niger

River. This investigation resulted in the recommendation of a route starting from Adrar (northwest of Insalah) and extending in a southeasterly direction over the southern edge of the Tademait plateau to the Haret valley. Beyond Imedden-Azarif the line assumes a southerly course in its passage through the valley separating the Ahenet, Emmidir and Ahaggar uplifts. The Niger River branch is projected to start in the valley of the Tamanraset, southwest of Silet and to pass west of the Adrar mountains, the Niger being attained at Tosaye, east of Timbuktu, between Bamba and Burem. The main line itself is to proceed east of the Adrar Mts. and strike towards Agades between the shifting sand dunes of the Tenere district. Thence a decided southeasterly course to the marshy region immediately north of Lake Chad will be maintained.



Based on a map in *La Géographie* for Feb. 15, 1914.

N.B.—The railroad between Colomb Bechar and Adrar should be indicated by dashes; also the Bauchi branch of the Nigerian railroad.

From the account of this expedition, as recorded by its leader in *La Géographie* (Feb. 15, 1914, pp. 73-109), it appears that valuable data on the orography of the central Sahara and the district immediately northwest of Lake Chad have been collected. A sketch map of this region based on all available earlier work and containing the data obtained by the railroad mission has been issued on a scale of 1:4,000,000. It is particularly informing as to the distribution and extent of shifting and stationary sand dunes and the location of the isolated granitic blocks. Particular attention was given to hydrography.

The line, as surveyed, has a length of 2,093 miles. Engineering problems will present no serious obstacles. Cuts and fills are small, the profile showing favorable evenness. The steel tracks will carry railroad penetration into the heart of Africa from Colomb Bechar, the present southernmost station of the French railroads. Observations confirm the error of regarding the Sahara as a

vast sandy desert. Explorations have revealed the fact that barely a quarter of the desert is covered by sand. Further knowledge of the wind régime of the entire region is needed, however, as during the windy season sand is transported over large areas, sand dunes being formed in every direction whenever a genetic nucleus occurs. The determination of the routes followed by air currents is therefore a study of prime importance in its relation to the possible difficulties to which railroad operation in the Sahara would be subject.

Besides the 1:4,000,000 map mentioned above the following cartographic documents have been compiled by the mission: (1) a 19-sheet map (1:400,000) of the region traversed by the projected railroad; (2) a 1:100,000 plan of the right-of-way between Ahaggar and Lake Chad as well as between Ahaggar and the middle Niger; (3) a profile and several cross-sections of the 1:100,000 plan. These surveys are supplemented by detailed reports on geology, geography, hydrography and meteorology.

Prof. Fritz Jäger's Mission to German Southwest Africa. Prof. Jäger started late in February for explorations in German Southwest Africa under the auspices of the German Colonial Office. He was accompanied by Dr. Waibel. He went first to Cape Town to travel through Cape Colony and investigate the economic conditions in that country, which in many respects resembles the German colony though its development is more advanced. He hoped to gain there points of view that may be valuable in the development of German Southwest Africa. His first work in that colony will be in the region of the Etosha Pan and the Karst region to the south of it for the purpose of hydrographic investigations. It is now known that in this region are underground lakes and it is of great importance to ascertain how far they may be available for the development of the land surface above them. From these investigations he will proceed to the northern part of the Kaoko Feld to draw a number of profiles to the coast and study the continental mass where it breaks down to the sea. Then he will investigate the limestone pans of eastern Damara Land described by Michaelsen in the *Mitt. aus den Deutschen Schutzgeb.* (No. 3, 1910). A systematic investigation of these limestone pans is much desired as they are the most important source of water for the cattle industry in that region. Jäger will everywhere give as much time as possible to geological and topographical investigations. Dr. Waibel will devote himself chiefly to plant studies, beginning his work before the arrival of Jäger and continuing it after Jäger's departure. (*Zeitschr. Gesell. für Erdk. zu Berlin,* No. 2, 1914, pp. 153-154.)

Incorporation of the Mayotte-Comoro Islands with Madagascar. The *Temps* of March 3, 1914, announces the promulgation of a decree, dated Feb. 23, 1914, which definitely ratifies the law of July 25, 1912, whereby the islands of Mayotte, Anjouan, Moheli, as well as Comoro and its dependencies, are henceforth to be administered as parts of Madagascar instead of as separate colonies. The change is due to the growth of commercial relations between the archipelago and Madagascar.

ASIA

Himalayan Glaciers. The Geological Survey of India is undertaking the systematic observation of the Himalayan glaciers (*Records Geol. Surv. India,* Vol. XXXV, 1907, pp. 123-157; *ibid.,* Vol. XL, 1910, pp. 52-62). This important work, undertaken in 1906 at the suggestion of Mr. D. W. Freshfield of the Commission International des Glaciers, has involved the mapping of fifteen glacier termini in Kashmir and Sikkim on the scales of one inch to 400 feet and one inch to 800 feet and the taking of photographs from marked stations. Future observations with the aid of these photographs and maps should determine the behavior of the glaciers with precision. It is already clear, from comparison of certain glaciers in 1906 or 1909 with the observations of the same ice tongues by Freshfield in 1899, Garwood in 1902, Conway in 1892, Hooker in 1854, and others, that many ice tongues have been long inactive. The Hispar Glacier retreated several hundred yards from 1892 to 1906.

Two ice tongues, however, have had notable advances. The Yengutsa Glacier moved forward at least two miles in 1901, covering cultivated fields. The Hassanabad Glacier had an advance about 1903, moving forward six miles or more, as observed by a native prince whose villages were threatened. This advance took place in two and a half months and the glacier had subsequently receded slightly, but it had had earlier oscillations.

It is to be hoped that these Himalayan glaciers may be revisited frequently, for they seem to show the same brief spasmodic advances of great magnitude separated by long periods of inactivity that have recently been observed in Alaska. In young mountains like those of northern India the suggestion of the earthquake-avalanche cause for these glacial advances can be tested. It will take frequent observations, however, for otherwise a brief period of activity may be overlooked. In Alaska, for example, we now know of over fifty cases of ice tongues which have advanced during the last fifteen years and have chanced to be observed through the opportune visit of some geologist or other traveler. Doubtless scores of other temporarily active glaciers have escaped observation. L. M.

AUSTRALASIA AND OCEANIA

Improvements at the Harbor of Sydney. According to *United Empire* (Vol. 5, 1914, No. 2, p. 160) over $30,000,000 are to be expended on improvements at Sydney Harbor, which is to be partly remodeled. Large additions are to be made to the wharfage. The new wharf frontage will be 42,600 ft. providing accommodation for 71 vessels each 600 feet in length. This great harbor development has been rendered necessary by the enormously increased traffic resulting from the agricultural development of New South Wales.

EUROPE

Adoption of the Greenwich Meridian in France. According to *La Géographie* (Feb. 15, 1914, p. 134) the Société de Géographie is in receipt of information regarding the adoption of the Greenwich meridian by the French Hydrographic Office, beginning with Jan. 1, 1914. Charts published after that date will conform with the general usage in this respect. They will thus acquire greater serviceability for use in conjunction with standard astronomical data which are commonly based on the Greenwich meridian as the initial longitude.

Change of Title of a Scandinavian Geographical Journal. Beginning with the volume for 1913, the *Geografiska Föreningens Tidskrift,* published six times a year by the Geografiska Föreningen i Finland of Helsingfors, changed its title to *Terra.* To those interested in geographical bibliography it may be well to recall the names of the remaining Scandinavian geographical journals, inasmuch as similarity of title may lead to confusion. The same association in Helsingfors also issues at irregular intervals a publication containing scientific papers which is entitled *Meddelanden af Geografiska Föreningen i Finland.* The other geographical society of Helsingfors, the *Sällskapet för Finlands Geografi,* publishes at irregular intervals the well-known journal *Fennia* with the French sub-title *Bulletin de la Société de Géographie de Finlande.* The remaining Scandinavian geographical journals are: the *Geografisk Tidskrift,* published in eight numbers to the volume, which covers two years, by the Kongelige Danske Geografiske Selskab of Copenhagen; *Det Norske Geografiske Selskaps Aarbok,* an annual issued by the Norwegian geographical society of Christiania; *Ymer,* published four times a year by the *Svenska Sällskapet för Antropologi och Geografi* of Stockholm; and, finally, the new *Meddelander fran Geografiska Föreningen i Göteborg,* begun in 1912 and to be continued at irregular intervals, published under the auspices of Prof. Otto Nordenskjöld of the University of Göteborg by the geographical association of that place.

PHYSICAL GEOGRAPHY

Geologische Charakterbilder. Edited by Dr. H. Stille. This series of illustrations of characteristic geological features is being published in parts, each consisting of six to eight plates with brief descriptive texts. They have as much interest to physical geographers as to geologists. They present striking features from all parts of the world and have been contributed by many geologists and physiographers. The views are reproduced most admirably; the text is in the language of the author. Nineteen numbers have already been issued by the publishing house of Borntraeger Brothers in Berlin, the last six of them in the summer and autumn of 1913. The following is a list of titles and authors of the numbers so far issued:

1.	Icebergs and inland ice of Antarctic region,	E. Philippi.
2.	Great erratic blocks in North German Lowland,	F. Wahnschaffe.
3.	Karst phenomena,	A. Grund.
4.	Morphology of French Alps,	W. Kilian.
5.	Morphology of the northern Adriatic and of Istria.	Goetzinger.
6.	Gneiss of northwest Greenland,	A. Heim.
7.	Basalt and sedimentary deposits of west Greenland,	A. Heim.
8.	The escarpment of the Odenwald near Heidelberg,	Spitz and Salomon.
9.	The Carinthian southern Alps,	G. Geyer.
10.	Karren in Alps of Switzerland,	Heim and Arbenz.
11.	Sandstone pinnacles, western United States,	N. H. Darton.
12.	Silica and lime deposition, western United States,	N. H. Darton.
13.	Caledonian thrust region of Swedish Lapland,	W. von Seidlitz.
14.	North border of middle Suabian Alps,	R. Lang.
15.	Morphology of French Alps, No. 2,	Kilian and Reboul.
16.	Lava fields of Kilauea, Hawaii,	A. Heim.
17.	Arid regions of Algeria,	S. Passarge.
18.	Recent river deposits in the northern Argentine Andes,	H. Keidel.
19.	The terminal moraines of the North German Lowland,	F. Wahnschaffe.

About 150 carefully selected views are given in these numbers and many of them are new and very instructive. The Alpine pictures have diagram oversheets on tracing paper, which add greatly to their usefulness, and several of the texts contain maps and cross sections explanatory of the pictures.

N. H. DARTON.

EDUCATIONAL GEOGRAPHY

GEOGRAPHY IN THE SUMMER SCHOOLS

The institutions mentioned below will send their summer school announcements to those interested.

Illinois. EASTERN ILLINOIS STATE NORMAL SCHOOL, Charleston, Ill. Three courses in geography: Geography of Northern Europe; Physiography; a lecture course covering types of work included in the Illinois state course of study.

ILLINOIS STATE NORMAL UNIVERSITY, Normal, Ill. Two terms: June 8 to July 17; July 20 to Aug. 26. Nine courses: The Land, the Ocean, the Atmosphere, Mathematical Geography, Mr. Russell; Method in Geography, Mr. Ridgley; Home Geography, Miss Stark; Intermediate Geography, Miss Robb, Miss McClellan; Geography of North America, Miss Robb; South America, Miss Stark; Conservation of Natural Resources, Mr. Ridgley; Commercial Geography, Miss Stark, Miss McClellan; Geography of Europe, Miss McClellan.

Iowa. STATE UNIVERSITY OF IOWA, Iowa City. In the summer session of six weeks a course on physiography will be given including the elements of

weather, climate and atmospheric phenomena with laboratory and lecture methods. Professor Trowbridge will take a small group of men into the field for five weeks when they will return to write up their field notes, prepare outlines, etc.

Maryland. Johns Hopkins University, Baltimore. Summer courses, July 6-Aug. 13. The work available in geography is limited to such material as is found in the courses in Greek archæology and art, the history of Greece and Rome, and courses on European and American history.

Michigan. Normal College, Kalamazoo. Land Forms; Climatology; General Geography—a study of type regions by the application of the principles developed in courses 1 and 2 and also the principles of distribution of plant, animal and human life; Commercial Geography; Michigan Geography; Home Geography—The geographical phase of nature study.

University of Michigan. (June 29-Aug. 21). A course for teachers and other students on physiography and the relation of the earth forms to the problems of geography, with lectures, laboratory work and recitations, by Prof. Sauer and assistant; Geography of North America, with lectures and assigned readings, Prof. Sauer and assistant.

Minnesota. University of Minnesota. General Geology, an introductory course covering the whole field, by Mr. Posey; Geography of Eurasia, open to those who take course 1 or its equivalent—a study of the geology, topography, climate, natural resources, people, industries and trade of these countries, Mr. Posey; Field course on the geography and geology of Minnesota, open to those who wish to study Minnesota at first hand. Four weeks June 22 to July 4, and July 20 to Aug. 1 will be spent in the field, Mr. Lehnerts; Field work in the Yellowstone and Glacier National Parks for the comparative study of the geology and geography of these parks, Aug. 3 to Aug. 22, Mr. Lehnerts.

New York. Columbia University. Physical Geography and Its Economic Aspects—lectures, laboratory and field excursions. Among the topics considered will be some phases of cartography including map projections and interpretation of topographic maps, climatology, oceanography, land forms, and their effects on distribution of population, human occupation, etc., hydrography, etc., with special attention to methods of teaching geography and of conducting laboratory work, Prof. D. W. Johnson and Mr. Knight; Physiography of the Eastern United States, lectures, laboratory and field work, Prof. Johnson and Mr. Knight.

Teachers College, Columbia University. The teaching of geography in elementary schools—lectures, reading and discussion, Prof. Dodge; Geography for Rural Schools—lectures, required reading and discussions, including a study of geographic facts and relationships, Prof. Dodge; Man and his geographic environment—lectures and collateral reading, a summary of the fundamental relationships between man and his geographic environment, Prof. Dodge.

New York University. Geography of the ocean and atmosphere (Lectures), Prof. Woodman; Geography of the ocean and atmosphere (Laboratory), Prof. Woodman; Principles of economic geography, Prof. Woodman; Economic Geography of Europe, Prof. Woodman; General physiography and geology (Field Course), Prof. Woodman and Prof. Earle; Geology and geography of our National Parks, Prof. Earle; Seminar in Geographic and Geologic Problems, Prof. Woodman and Prof. Earle.

Cornell University. Physical Geography, Assistant Prof. von Engeln; Industrial and Commercial Geography—adapted to the needs of teachers in high and grammar schools, Prof. Carney; Geography of North America—designed to give a broad conception of continental evolution and the geographic adaptation of North America for human occupation, Assistant Prof. von Engeln; Aims and Methods in Geography, primarily for normal school and grade teachers—lectures and discussions on such topics as home geography,

the earth as a planet, mathematical geography, cartography, field lessons, the inter-relations of physical and human geography and the claims of commercial and of regional geography; Physical Geography Laboratory, Prof. Carney.

North Carolina. UNIVERSITY OF NORTH CAROLINA, Chapel Hill. General Geography—dealing with Home Geography and the Geography of North Carolina, with principles, their application, methods of teaching, etc., Instructor John E. Smith; Geography for Secondary Schools; Topographic Forms and their Influence on Human Affairs; Natural Provinces of North Carolina and the United States, historical, commercial and industrial phases emphasized; Laboratory Equipment and Field and Laboratory Methods of Instruction. The classes in geography will make field excursions and industrial trips to mills and factories, Instructor John E. Smith; Advanced geographical field work and special research—a study of the etched peneplain of middle North Carolina in relation to the economic and historical geography of the state with special reference to transportation. This course covers five weeks, one at Chapel Hill and four devoted to field study, Prof. Collier Cobb.

Ohio. OBERLIN COLLEGE. June 26-Aug. 14. Topographic Surveying—consists of practical experience in the mountains with plane table, transit and level, in the methods of making the topographic map.

Pennsylvania. UNIVERSITY OF PENNSYLVANIA. July 1-Aug. 15. Commercial Geography of the United States—lectures dealing with resources, products and industries, supplemented by excursions to industrial plants, George B. Roorbach, A.B., Instructor in Geography; Physical and Economic Geography, special reference to the influence of land forms upon man's activities—the course will consist of lectures and field excursions, Mr. Roorbach; Resources and Industries of South America, a Regional Study of the Continent, Mr. Roorbach.

Wisconsin. UNIVERSITY OF WISCONSIN. Geography of Europe, Professor Lawrence Martin; Regional Geography, Prof. Martin; Elementary Geology, Prof. Martin; Physical and Applied Geography, Prof. R. H. Whitbeck; Industrial and Commercial Geography, Prof. Whitbeck; Field Courses in Geography and Geology, during August, in the region of Devil's Lake, Wis., in charge of Prof. Martin.

PERSONAL

Professor R. E. Dodge, of Teachers College, New York, will give a part of this summer to his duties as editor of the *Annals of the Association of American Geographers.*

Dr. Fuller, of the University of Chicago, plans to take a party of students to the Colorado Rockies for field study in plant geography.

Prof. George D. Hubbard of Oberlin University, will go to Virginia as usual with a party of geologic and geographic students for seven weeks. During the remainder of the vacation he will continue his physiographic studies for the Geological Survey of Ohio.

Prof. E. M. Lehnerts, of the University of Minnesota, will conduct the main party of the National Education Association through the Yellowstone National Park at the close of their convention at St. Paul. The party will leave St. Paul on July 10.

Prof. T. H. MacBride has been appointed Acting President of the State University of Ohio in place of President John G. Bowman, resigned. Prof. MacBride has been connected with the University for thirty-six years, for many years head of the department of Botany.

Mr. François E. Matthes of the U. S. Geological Survey has been elected Corresponding Member of the International Glacier Commission. He lectured at Yale University on Feb. 19 on "Topographic Delineation" and on Feb. 20 on "The Glacier System of Mt. Rainier."

Prof. Lawrence Martin of the University of Wisconsin has been elected a Corresponding Member of the International Glacier Commission. Following the summer school at the University he expects to do field work for the State Geological and Natural History Survey preliminary to writing an educational bulletin upon the geography of the Rock River Valley of Wisconsin.

Mr. J. W. Redway's specific work for the past two years has consisted of a study of the flood plains of the Ohio Valley with reference to recent floods and an investigation of the changes in the Yellowstone Park geyser basins between two visits forty-three years apart.

Mr. E. W. Shaw of the U. S. Geological Survey spent two months of last fall in the continuation of the studies of the Mississippi Delta and of the physiography of the gulf and embayment. Following this he made a reconnaissance examination of some deltas in Europe, Egypt and Syria. His field work this spring and summer will be upon the physiography of Southern Illinois and of the gulf embayment.

Prof. V. E. Shelford, of the University of Chicago, will spend the first half of the summer giving a course in marine animal ecology at the Puget Sound Marine Station, Friday Harbor, Washington; and the second half at the University of Chicago, giving a course in physiographic animal ecology in the University of Chicago, carrying on investigations in both places.

Prof. B. Shimek of the State University of Iowa will spend some time at the University of Prague where he will lecture on plant ecology dealing chiefly with American deserts and prairies. He will visit a few German universities and return in September. He has been invited to deliver two addresses before the meeting of biologists and physicians at Prague.

OBITUARY

Sir John Murray. It is with great regret that the *Bulletin* announces the death of Sir John Murray, the distinguished oceanographer, who was killed in a motor accident near Edinburgh on Monday, March 16. For a generation Sir John Murray had been regarded as one of the greatest authorities on the ocean and its problems. He was born at Coburg, Ontario, in 1841, the second son of Robert Murray, an accountant. When seventeen years old he went to Scotland to complete his education at the University of Edinburgh, devoting himself to literature under Prof. Masson and to science under Kelvin, Tait and Clerk Maxwell. Mr. Murray became known through his intimate association with the *Challenger* Expedition. He was prominent in organizing and equipping this great enterprise in 1871-72. The *Challenger* explorations were made between 1872 and 1876. Nearly all the seas of the world were penetrated and the expedition practically established the foundations of our knowledge of the ocean and of the enormous area of the globe which it hides from view. Murray devoted himself to the study of the deep sea deposits, the pelagic organisms, the vertebrates and protozoa and had charge of all the collections. The study and working out of these collections and the other results formed a stupendous task and lasted very much longer than the expedition itself. The reports cover 50 large royal quarto volumes. In 1880 and 1882 Sir John Murray took part in the exploration of the Faroe Channel. He was also the chief promoter of the minute exploration of the Scottish lochs, the results of which, with fine maps by Bartholomew, were published several years ago. With Dr. Johan Hjort of Norway, he conducted a deep sea expedition in 1910 in the Atlantic on the research steamer *Michael Sars*, the cruise extending from the coasts of Europe and Africa down to Cape Bojador, across the Sargasso Sea to St. John's, N. F., and eastward across the Atlantic to Ireland and the Faroe Islands. The journey resulted in a large number of temperature and other observations and the collection of many specimens. Throughout his scientific career, Sir John was a large contributor to the literature of the ocean and of some other phases of physical geography. Our Council awarded the Cullum Geographical Medal to Sir John Murray in 1899 in recognition of his many distinguished services to science. The inscription was: "Awarded to Sir John Murray, K.C.B., naturalist, deep sea explorer, oceanographer, editor of the *Challenger* Reports."

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

California Tourist Guide and Handbook. Authentic Description of Routes of Travel and Points of Interest in California. By Wells Drury and Aubrey Drury. 354 pp. Maps, ills., index. Western Guidebook Co., Berkeley, Cal. $1.25. 7 x 4½.

Travelers in California will find this book a helpful guide. It describes in detail the points of interest along the railroad lines of the state. Prospective visitors, in planning an itinerary, would do well to study the Guide for side trips as well as for the main lines of travel. Unfortunately for the best use of the volume the author has neglected to study the needs of the consultant in maps, for a number of these are on too small a scale to be of value. ROBERT M. BROWN.

Early Days on the Western Slope of Colorado and Campfire Chats with Otto Mears, the Pathfinder. From 1870 to 1883, Inclusive. By Sidney Jocknick. 384 pp. Ills. Carson-Harper Co., Denver, Col., 1913. $1.75. 8 x 5½.

A flavor of pioneer days is imparted by this account of the author's experiences among the Ute Indians round about the Uncompahgre Valley between 1870 and 1880. The community, not unlike others in the early days, had its strong men and its unscrupulous ones. Jocknick gives a vivid idea, and without doubt a true one, of his hero, Otto Mears, the pathfinder of the San Juan, and of other men. He devotes chapters to the tragedies of the early days when lawlessness could be easily concealed, while the stories of Packer and Howard, the one a criminal of low type and the other a highwayman, have been repeated probably in many places in the great west. We also find here an insight into the workings of the Indian agencies from the point of view both of the agent and the Indian. The book gives a plain, unpretentious account of an early phase of American life. ROBERT M. BROWN.

The Physiography of the Rio Grande Valley, New Mexico, in Relation to Pueblo Culture. By E. L. Hewett, J. Henderson and W. W. Robbins. 76 pp. Map, ills. *Bur. of Amer. Ethnol. Bull. 54.* Washington, 1913. 9½ x 6.

This is a collection of three papers. The first by Hewett on the Rio Grande Valley, New Mexico, contains a general description of the geological and physiographic features of the region. The second is a more detailed study of El Rito de los Frijoles, a small and somewhat typical canyon valley on the western side of the Rio Grande. This paper presents three major points, the origin and age of the tufa which forms the sides of the canyon, the slow process of erosion as indicated by the positions of ancient pueblos and the steep character of the south facing wall of the canyon as compared with the more gently sloping north wall, a feature which the author attributes to differential frost action. The third paper is by Henderson and Robbins on Climate and Evidences of Climatic Changes. The belief in a slow desiccation of this region is based on historical, botanical and geological evidence. The ruins in the valley point to a considerable population a few centuries ago; these people raised corn where corn cannot be grown to-day; there appear to have been extensive lakes formerly where the ratio of evaporation

to precipitation does not now permit them; and the glaciers which have disappeared or are receding in the Southern Rockies seem to indicate a change in climate which is probably still in progress. These papers supplement one another and form an interesting and valuable contribution.

ROBERT M. BROWN.

The Conquest of Mount McKinley. The Story of Three Expeditions through the Alaskan Wilderness to Mount McKinley, North America's highest and most inaccessible Mountain. By Belmore Browne. Appendix by Herschel C. Parker. xvii and 381 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1913. $3.50. 9 x 6½.

This book not only chronicles a feat of mountaineering but also gives to the public the final word concerning the alleged ascent of McKinley by Dr. Cook. The story includes three attempts to scale the peak. The first expedition, in 1906, when Dr. Cook led the party, approached the mountain from the south by way of the Yentna River; the second expedition, in 1910, tried to reach the top from the southeast; and the final expedition, in 1912, attacked the peak from the north. It was a month or so after the failure of the 1906 expedition that Cook announced his success in reaching the summit. The author has inserted convincing proof (if any one needed it) of Dr. Cook's hoax, in the pictures opposite pages 114 and 122 which are taken from the same position as Cook's McKinley pictures, and which reproduce the scenes of pictures printed by him in his book. Brown, during the 1910 trial, located the scenes of Cook's fake pictures. The location of these pictures was found to be only 5,300 feet above sea level and over twenty miles from Mount McKinley.

The first and second expeditions were not successful as far as Mount McKinley was concerned. Yet the account of a failure of this kind is as illuminating and interesting as that of a success and the reader will not be disappointed in the earlier pages of the book which embody the results of the two attempts, as adventure, feats of skill and endurance and thrilling experiences are not lacking.

The 1912 expedition, profiting by the earlier failures, was well equipped to make a last, hard effort. The ascent of the north slope is a particularly interesting story. There were days of hunting before McKinley was reached, a particularly vivid account of an avalanche with a series of five illustrations showing stages of its approach, and the common experiences with crevasses and storms. The party were able to reach 11,000 feet with a dog team, and here was the main camp from which, by a series of stages which lasted altogether twenty-eight days, the work of conquest was pushed. At the end an elevation of about 20,300 feet was reached, the last hard climb was done and only a gentle slope separated them from the coveted goal when the party was forced to turn back on account of a blizzard of unusual intensity. Although the credit for reaching the top of Mount McKinley goes to a later explorer, the credit of the conquest of the peak belongs to the members of the 1912 expedition. The book is a worthy addition to the library of mountaineering, and the artist-author has not only written an interesting story but he has, with his paintings and drawings, illuminated many phases of the experience of the party.

ROBERT M. BROWN.

The Wilderness of the Upper Yukon. A Hunter's Explorations for Wild Sheep in Sub-Arctic Mountains. By Charles Sheldon. xxi and 354 pp. Ills., index. Charles Scribner's Sons, New York, 1911. $3. 9½ x 6½.

This account, in the main a hunter's tale, gives considerable information about the territory north of Skaguay in the Yukon Territory, ranging from the Coast Ranges to the Ogilvie Rockies. The first impression of the book is altogether unfavorable owing to the character of some of the illustrations, which are of no value except as a memento of the killing ability of the author. The text gives a saner idea of the hunting trip. As readable accounts of the area are few in number, this book will be to many a source of information. It must be noted, however, that the author was solely interested in

wild sheep and his aim is merely to give the information from the standpoint of a hunter and a naturalist; but still, by photographs and reports of daily experiences in climbing and camping, a fair appreciation of the topography and the climate of the upper Yukon is gained. ROBERT M. BROWN.

A Motor Tour Through Canada. By Thomas W. Wilby. xviii and 290 pp. Ills., index. John Lane Co., New York, 1914. $1.50. 8 x 5½.

Mr. Wilby gives us the panoramic view of Canada as seen from the tonneau of a motor car on its journey from Halifax to Victoria. In easy style, largely abounding in conversations with persons whom he met on his tour, he relates an agreeable story of his experiences. Among those stand out prominently his impressions of the Northwest Mounted Police and their prisoners. The half-tone reproductions add interest to his tale. DAVID H. BUEL.

CENTRAL AMERICA AND WEST INDIES

La Nouvelle Voie Maritime: Le Canal de Panama. Par Daniel Bellet. 330 pp. Map, ills. Series: Bibliothèque des Amis de la Marine. E. Guilmoto, Paris, 1913. Fr. 5. 8 x 5.

Mr. Bellet's book on the Panama Canal will make its appeal, perhaps, to all except Americans. In it he never loses sight of the fact that the French should be credited with the Canal's first inception, and much space is given to the preliminary French work. A chapter on sanitation gives a very good description, including statistics, of the splendid work of Colonel Gorgas on "cleaning up" the Canal, showing the wonderful decrease in the mortality on the Zone from 47 to 19 per 1,000 in three years.

Even though the Canal be completed, grave difficulties may arise and give constant apprehension, as, for example, the landslides and, even more, the chemical composition of the underlying rocks of the Gatun Dam, which, geologists suggest, may in time become soft through saturation.

The work would be more acceptable if Mr. Bellet had not introduced so much bitterness at the success which the "Yankees" (so called throughout the book) achieved, where the French so woefully failed. A. C. B.

Twentieth Century Jamaica. By H. G. de Lisser. 208 pp. Ills. The Jamaica Times, Ltd., Kingston, 1913. 8 x 5½.

Will Jamaica be absorbed by the United States or Canada or remain the possession of England? Mr. de Lisser considers this problem in detail. He next takes up the history of the island, describes the cities, towns and country; the life of the people, their beliefs, customs, religions, politics, industries and commerce. The book is well worth reading.

WILBUR GREELEY BURROUGHS.

The Southland of North America. By G. P. Putnam. xiv and 425 pp. Map, ills. G. P. Putnam's Sons, New York, 1913. $2.50. 8 x 5½.

A series of entertaining sketches conveying vivid impressions of scenic wonders and easy-going customs. The author shows remarkable comprehension of the Latin-American turn of mind. His comments on the contrasting business methods adopted by Europeans and Americans deserve attention. Of special interest are the accounts of his meetings with his countrymen. The book will be read with especial pleasure by all who have traveled in Central America. LEON DOMINIAN.

SOUTH AMERICA

The South American Tour. By Annie S. Peck. 398 pp. Map, ills., index. George H. Doran Co., New York, 1913. $2.50. 8½ x 5½.

In the years during which the Panama Canal has been nearing completion the South American tour has been coming into its own. Miss Peck's book is designed to help the South American tourist on his way. Railroad and steamship lines are catalogued, the principal hotels and their prices are listed, the points of interest are indicated, and useful historical information

is supplied. The account of the Harvard Observatory, near Arequipa, and its work is noteworthy; also the account of the trip in the new tunnel through the Andes from Argentine to Chile. Director General John Barrett of the Pan American Union writes an appreciative preface. DAVID H. BUEL.

Venezuela. By Leonard V. Dalton. 320 pp. Map, ills., index. T. Fisher Unwin, London, 1912. 9 x 6.

Venezuela is known among us as the land of coffee and asphalt, of Bolivar and Castro, upon the occasion of whose boundary dispute with Great Britain President Cleveland pronounced his strong reassertion of the Monroe Doctrine. In the 241 pages of his book the author of this work gives a clear but brief account of all these matters. The chapters on the history of the country, political, commercial and industrial, are more extended than those dealing with the geography, geology, botany, zoology and ethnology. His account of education in Venezuela is quite brief, perhaps because education itself is not much developed there. The illustrations are good half-tones of the scenery, public buildings and monuments of the country. A map in black and white displays the mountains, rivers, international and state boundaries, the capitals, railroads and roads of Venezuela. The appendices record the figures for population, trade, meteorology, vital statistics, and finance. The bibliography quotes 411 works on Venezuela. The final chapter on the future of the country is timely. DAVID H. BUEL.

AFRICA

The Agricultural and Forest Products of British West Africa. By Gerald C. Dudgeon. Imperial Inst. Handbooks. x and 170 pp. Maps, ills., index. John Murray, London, 1911. 5s. 9 x 5½.

A careful account of the vegetable commercial resources of Gambia, Sierra Leone, Gold Coast, Ashanti, Northern Territories, Northern Nigeria and Southern Nigeria.

The Guide to South and East Africa for the use of Tourists, Sportsmen, Invalids and Settlers. Edited annually by A. Samler Brown and G. Gordon Brown. liv and 695 pp. Maps, ills. Union-Castle Mail SS. Co., Ltd., London, 1913.

This book improves with every issue. An enormous amount of accurate and up-to-date information is made readily accessible by a good index. The most important maps, by George Philip & Son, have the symbolism used by the best map-makers of Germany and are fine specimens of scientific map generalization. For the vast territory covered this book is one of the best reference sources.

Botanical Features of the Algerian Sahara. By William Austin Cannon. vi and 81 pp. Map, ills. Carnegie Inst., Washington, D. C., 1913. $2.50 10 x 7.

The principal object of this entertaining volume is to add to the breadth of the phytogeographic studies now prosecuted at the desert laboratory of the Carnegie Institution. To geographers the great value of these researches is that they serve to establish upon an observational basis the problems of desiccation in their relation to habitability in past epochs. No little study has been devoted of late to the questions of climatic variation in reference to the very extensive remains of former habitation of the greater deserts. Sir Aurel Stein, Sven Hedin and Prof. Ellsworth Huntington have furnished data covering the deserts of inner Asia, Prof. Huntington has proposed a theory of desiccation. Mr. Cannon in this careful paper reads the lesson of the plants and makes plain the significance of the line of equilibrium, of balanced poise between the aeolian waste of sand and the plant growth of the arid region. In the end these two forces tend to establish permanence, but in the episodes there is an unevenness in the action of the forces, the vegetal force being slow and sure to the very limit of its possibility, the aeolian marked by sudden and

extensive inroads irregularly spaced between periods of quiescence. For the purposes of social geography it is very fortunate that the Algerian region of study is one for which we have not only the material remains of human occupancy but in addition a not inconsiderable written record of historical material. From this fortunate association of phytogeography and a more or less complete record extending over twenty centuries it may be possible for the students of desiccation to establish a time scale by which to measure similar phenomena where the problem must rest most largely on the record of desert vegetation alone.

WILLIAM CHURCHILL.

The Tribes of Northern and Central Kordofán. By H. A. MacMichael. Cambridge Archaeol. and Ethnol. Series. xv and 259 pp. Maps, index. University Press, Cambridge, 1912. G. P. Putnam's Sons, New York. 10s. 6d. 8½ x 5½.

We have here another volume in the Cambridge Ethnological Series in which the influence of Dr. A. C. Haddon is most manifest. This monograph gives us a concise statement of all that is known of the past and present of the wild tribes of the Sudan who came out of their seclusion a few years ago to give their hopeless battle against the European advance upon Africa. As is usual in wars, these men of the Mahdi knew very little of what they were fighting for and still less of why they were beaten. Equally the British had very faint information as to the reason of their fighting, but they carried away a profound respect for the battle abilities of these "first-rate fighting men." This seems to tinge Mr. MacMichael's attitude toward the people of his study. He finds them a good lot of semi-savages and his study is interesting. He has conducted careful researches through the tangle of the history of Kordofan and has done considerable toward evaluating the different narratives. Despite all his efforts the meaning of the name Kordofan is still incomprehensible.

Hausa Folk-Lore, Customs, Proverbs, etc. Collected and Transliterated with English Translation and Notes. By R. Sutherland Rattray. With a preface by R. R. Marett. Vol. 1: xxiv and 326 pp. Vol. 2: 315 pp. Ills. Oxford University Press (Amer. Branch), New York, 1913. $9.25 two vols. 9½ x 6½.

Not only is this material of the utmost value in the study of African folklore but Mr. Rattray has followed a method which should serve as a model for such inquiry. Qualified as an interpreter in the Hausa and in several cognate tongues he has recognized the factor of error which is introduced when the European observer is obliged to collect tales from word of mouth and subjects them to the double chance of error in transcription and translation. Mr. Rattray selected one of the wisest of Hausa and instructed him to write out the manuscripts here reproduced in facsimile. Facing each page is transliteration and translation and thereby the idiom may be literally followed and the possibility of wrong interpretation reduced to the minimum.

We seem in this work to have opened a new pool of African tales, for several motives are introduced which are not found in the great mass of African animal stories. Here we have several instances of the story based on name-magic, a motive which still exists in our child lore but derived from an entirely different source. Here is a sample: The good but scorned wife finds a spoon. Its name is Help-me-that-I-may-taste and every time she calls the spoon by name her calabash is filled with food. The wicked wife becomes envious; she goes out and finds a switch. Its name is Whack-me-that-I-may-feel, she gets a sound beating, and virtue triumphs. In several tales we find the wise and mischievous spider playing tricks upon the other animals, and through the Sierra Leone stories we are able to establish the association of the sage spider with the great body of Brer Rabbit myth which is spread so extensively through Africa.

WILLIAM CHURCHILL.

South Africa. Seven Lectures. Prepared for the Visual Instruction Committee of the Colonial Office by A. J. Sargent. Visual Instruction Comm. Handbooks, No. 5. 120 pp. Maps, ills. G. Philip & Son, Ltd., London, 1914. 8d. 7½ x 5½.

Contains outlines of a course of seven lectures on South Africa including

all the British territory; with references to the lantern views prepared for the lectures. The book treats soundly of the geography, resources and development of South Africa and is a dependable source of reference.

African Missions. Impressions of the South, East, and Centre of the Dark Continent. By Benjamin Garniss O'Rorke. With a preface by The Right Rev. J. Taylor Smith. viii and 213 pp. Map, ills., index. Soc. for Promoting Christian Knowledge, London, 1912. 3s. 6d. 8 x 5.

An excellent, accurate account of some of the leading missionaries of Africa and of their effective participation in the beginnings of the modern development of the continent.

ASIA

Syria, the Land of Lebanon. By Lewis G. Leary. 225 pp. Ills., index. McBride, Nast & Co., New York, 1913. $3. 9½ x 6½.

This charming little volume is all the more interesting because it is replete with the personal enthusiasms of the writer. In his preface he observes that in the company of his earlier work on Palestine this volume may furnish a complete view of the lands of the Bible. This is true only in a literary and artistic sense, for there is nothing which smacks of the handbook to the Scriptures. In his method of treatment the Sacred Canon is but the earliest and most familiar literature of the subject; its imagery and its phrases come into mind when we approach the scenes with which for ages they have been associated, the cedars of the Lord, the cedars of Lebanon, the figures which hang like fringes on Hermon dominating the distant prospect. The Syria of the present has a warm and happy appeal to the author, he glories in the Syria of the lengthening past surrounding Damascus, oldest of the cities of men, alive to-day as alive in the dawn. He is always seeing the brave procession, Saladin and Richard but yesterday, the sweep of the crescent, the march of legions to overthrow Zenobia in Tadmor of the desert, the combat of St. George, the coming of the cross, the hosts of the Egyptians under conquering Pharaoh, the Hittites, the beginning of time. WILLIAM CHURCHILL.

Trans Himalaya. Discoveries and Adventures in Tibet. By Sven Hedin. Vol. 3. xv and 426 pp. Maps, ills., index. The Macmillan Co., New York, 1913. $4.50. 9 x 6.

An interval of three years separates the appearance of Hedin's third volume from the other two. In this last volume he fills in some of the gaps in his earlier narrative and brings his last journey in Tibet to an end. He also takes occasion to answer various criticisms aroused by his earlier work. Most of the volume consists of a description of a journey from the sources of the Indus to Ladak and of his final excursion from Lake Nganglaring via Lake Manasarowar to Simla. He gives the details of each day with great minuteness. No special adventures mark these journeys and therefore the space is given to vivid descriptions of scenery and of Buddhist lamaseries.

In three places Hedin breaks the thread of his journey to insert a series of chapters of a somewhat controversial nature. In the first series he gives an historical account of all that was known of the Trans-Himalayas previous to his journey. He shows that although mountains beyond the Indus and Brahmaputra are frequently referred to, the world had not realized their existence as a separate entity. It is truly remarkable, as he says, that one of the world's greatest mountain ranges should have remained almost unknown until after the discovery of the poles.

The second interruption deals with the lakes of Manasarowar and Lanak-tso, or Rakas-tal. Formerly four rivers, the Brahmaputra, Ganges, Sutlej and Indus were supposed to flow from the holy lake of Manasarowar. It has been a long process to discover that the Sutlej alone flows from it, and that much of the time even this receives no water. The two lakes together form a very delicate rain-gage, for Manasarowar overflows to Lanak-tso at fairly frequent intervals, while Lanak-tso overflows to the Sutlej only at periods a

century or two apart. Unfortunately the records are incomplete and inexact. This condition of the lakes naturally leads to the problem of changes of climate, but Hedin says little about it except to remark that "it seems as though the climate in the present period is tending toward greater dryness." This agrees with his earlier conclusions, but in the interim he has been strongly of the other opinion.

The third interruption in the narrative deals with Lamaism and Catholicism, and has no special geographical bearing.

Perhaps the strongest impression left by the book is the remarkable contrast between the broad, undissected highlands of the great plateau and the tremendously dissected border region where the rivers break through the Himalayas and have cut enormous gorges. In reading this book, as in reading all the others by the same author, one cannot but admire Hedin's remarkable capacity for travel in difficult places and his power of vividly describing his experiences. ELLSWORTH HUNTINGTON.

La Pluie en Chine durant une Période de Onze Années 1900-1910. Par Louis Froc. Première partie: Les Observations. 1912. 62 pp. Diagrams. Observatoire de Zi-Ka-Wei, Appendice au *Bull. Météorol. de 1910*. Shanghai. 12 x 10.

In 1896, Supan gave us a very careful study of the rainfall of China. Since then, observations have been accumulating which throw further light on this subject, although, of course, stations are still few in number, and mostly near the coast. Father Louis Froc, S.J., Director of the Zi-Ka-Wei Observatory, whose excellent work on meteorology is well known, has now collected and summarized the available rainfall records for a homogeneous period of eleven years for thirty-four stations, and for some forty other stations with shorter and broken records. Not only are the annual and monthly means considered, but the number of rainy days, the amount of rainfall on a rainy day, etc. Curves showing the annual variation of rainfall and the seasonal means are also given. For those who are studying Chinese climate this publication will prove indispensable. R. DEC. WARD.

Au Yunnan et dans le Massif du Kin-Ho (Fleuve d'Or.) Par A. F. Legendre. xii and 433 pp. Map, ills. Plon-Nourrit et Cie, Paris, 1913. 8 x 5½.

This is the third volume of the reports of Dr. Legendre upon the results of his years of study of the life of the Chinese of the far west, the preceding volumes having dealt with Sechuan and Kien-chang and the lands of the Lolo. This later expedition met with the misfortune of the recent upheaval of the Middle Kingdom, for at Hwang Chuitang Dr. Legendre was attacked by revolutionaries and, with his companion, Dessirier, received many severe wounds. His escort took to its heels and the two Frenchmen owed their lives to the fact that the marauders preferred to lose no time in looting the caravan. The terrain covered in this close exploration lies between Yunnan Sen and Yatcheou, between 25° and 30° N., and never far away from the meridian of 100° E. Herein is embraced a considerable area of the agricultural valleys of the Tong Ho, the Ya Long and Ngan Ning, and the southerly bend of the Yang-tse-kiang near the point where it receives the waters of these two streams just below their confluence. Much of this is newly opened territory and none of it has received before such close study in topographical detail. The leader, as soon as his wounds permitted, succeeded in recovering no inconsiderable part of his collections and two of his record books of Yunnan; unfortunately the day books of the unknown country were not recovered and this report, so far as it deals with its most valuable material, has had to be written from memory. WILLIAM CHURCHILL.

Missionary Joys in Japan; or, Leaves from my Journal. By Paget Wilkes. With an introduction by the Rev. B. F. Buxton. xvi and 321 pp. Ills. Morgan & Scott, Ltd., London, 1913. 7s. 6d. 9 x 6.

There is very little of Japan in this record of fifteen years spent in mission

service. Yet here we have a wealth of topical material of great interest and value. Each chapter, for example, is prefaced by a green sheet reproducing in Japanese script and in translation one of the Japanese formal poems; they have no pertinence to the author's text, their purpose is purely decorative, yet they are worth the space given them. Their classic poise of thought is in strange contrast with the English text which they accompany.

The Evolution of New Japan. By Joseph H. Longford. Cambridge Manuals of Science and Literature. 166 pp. Map, ills., index. G. P. Putnam's Sons, New York, 1913. 1s. 7½ x 5.

Professor Longford's little volume is of the primer type, much information compressed into a shilling's worth of room and all debatable points set forth in positive statement after the manner of such publication. It will serve excellently as the introduction which may guide the beginner toward more extended study of the island empire. The author has had years of consular experience in Nagasaki and therefore is in a position to speak with authority superior to that of many writers. We might wish that he had not gone somewhat out of his way, in recording the end of the Russian war, to note that the peace was signed at Portsmouth, "New Jersey, U. S. A."; probably every child in school knows that our Portsmouth was named after the English Portsmouth and that they are in New Hampshire and Hampshire respectively. Surely no American book could issue from the press of any American university with such a statement as that Portsmouth is in Yorkshire, England.

The Island Dependencies of Japan. An account of the islands that have passed under Japanese control since the Restoration, 1867-1912. A series of monographs, reprinted from the *Imperial and Asiatic Quarterly Review,"* with additions from native sources, translations and new information. By Charlotte M. Salwey. ix and 147 pp. Maps, ills. E. L. Morice, London, 1913. 5s. 9½ x 6½.

The author is an admirer of things Japanese, but in her theme we are not asked to discount her enthusiasms. It is when the culture of Japan is brought into contrast with European cultures that the difficulty of shrewd interpretation arises. In the present theme we find Japan brought into cultural contrast with peoples markedly inferior. Everything that Japan has done for its island dependencies has been a work for betterment, an amelioration of the conditions of the savage. With this foreknowledge we must welcome the praise which the author bestows upon this really great work in desert places, for we know that the praise is deserved beyond any cavil. In six chapters she deals somewhat exhaustively with Japan as the civilizing agent of her island dependencies, Formosa, the Riu-Kiu, the Bonins, the Kuriles, Sakhalin, and the Pescadores with minor islets. It is only recently that we passed under review a Japanese report on the control of the Formosa aborigines; the chapter in this book is of wider scope but it is simply confirmatory of the excellent effect which was produced by the official report upon its single theme. In her chapter upon southern Sakhalin, Mrs. Salwey suggests a topic which must in future attract much greater attention from geographers and ethnographers. In cementing its power upon this region, which appeals to the Japanese nation as essentially an integer in the island empire, the government has sent its geodesists into the north; and with settlement, which is now being stimulated in order to relieve the overcrowding in the northern islands, we may expect soon to have valuable reports from the scientific men of Japan.

WILLIAM CHURCHILL.

Village Life in Korea. By J. Robert Moose. 242 pp. Ills. Smith & Lamar, Nashville, Tenn. $1. 8 x 5½.,

The author gives us a valuable village record, the story of a race which has undergone for many centuries a singularly secluded development, wholly unreceptive toward any influence from outside and growing into a marked

accentuation of a stationary type. His eye has shown itself alert for all the little things of life which count for so much in the differences of one community from another; these he has set down with such simplicitiy that we gain the impression that his record has largely increased our acquaintance with the Koreans in their daily life. WILLIAM CHURCHILL.

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later.

NORTH AMERICA

THE CHANNEL ISLANDS OF CALIFORNIA. A book for the angler, sportsman, and tourist. By C. F. Holder. 2nd edit. xvi and 397 pp. Ills., index. A. C. McClurg & Co., Chicago, 1910. $2. 8½ x 5½.

DOCUMENTARY HISTORY OF DUNMORE'S WAR, 1774. Compiled from the Draper Manuscripts. Edited by R. G. Thwaites and L. P. Kellogg. xxviii and 472 pp. Ills., index. Wisconsin Hist. Soc., Madison, 1912. $2. 7½ x 5½.

THE DOMINION OF CANADA. By W. L. Griffith. x and 450 pp. Map, ills., index. Little, Brown & Co., Boston, 1913. $3. 8½ x 6.

THE EXPEDITION OF THE DONNER PARTY AND ITS TRAGIC FATE. By E. P. Donner Houghton. xxi and 375 pp. A. C. McClurg & Co., Chicago, 1911. $1.70. 8½ x 5½.

FIFTEEN THOUSAND MILES BY STAGE. A woman's unique experience during thirty years of path finding and pioneering from the Missouri to the Pacific and from Alaska to Mexico. By C. A. Strahorn. xxv and 673 pp. Ills. G. P. Putnam's Sons, New York, 1911. $4. 9 x 6½.

THE FISHES OF THE PACIFIC COAST. A handbook for sportsmen and tourists. By C. F. Holder. 122 pp. Ills. Dodge Publishing Co., New York, 1912. 50 cents. 8 x 5.

FRONTIER DEFENSE ON THE UPPER OHIO, 1777-78. Compiled from the Draper Manuscripts. Edited by R. G. Thwaites and L. P. Kellogg. xvii and 329 pp. Map, ills., index. Wisconsin Hist. Soc., Madison, 1912. $2. 7½ x 5½.

THE INDIANS OF TO-DAY. By G. B. Grinnell. Revised edit. 426 pp. Ills., index. Duffield & Co., New York, 1911. $2. 8 x 5½.

LEWIS EVANS: His Map of the Middle British Colonies in America. A comparative account of ten different editions published between 1755 and 1807. By H. N. Stevens. 41 pp. H. Stevens, Sons & Stiles, London, 1905. 5s. 9 x 6.

LOUISIANA UNDER THE RULE OF SPAIN, FRANCE AND THE UNITED STATES, 1785-1807. Social, Economic, and Political Conditions of the Territory represented in the Louisiana Purchase as portrayed in hitherto unpublished contemporary accounts by Dr. Paul Alliot and various Spanish, French, English, and American Officials. Translated or transcribed from the original manuscripts. Edited by J. A. Robertson. Vol. 1: 376 pp. Vol. 2: 391 pp. Maps, index. A. H. Clark Co., Cleveland, O., 1911. $10. 9½ x 6½.

THE MOUND BUILDERS; being an account of a remarkable people that once inhabited the valleys of the Ohio and Mississippi, together with an investigation into the archæology of Butler County, O. By J. P. MacLean. 7th edit. 231 pp. Ills. Robert Clarke Co., Cincinnati, 1904. $1.50.

NOVA SCOTIA: The Province That Has Been Passed By. By B. Wilson. Revised edit. xii and 258 pp. Ills. Constable & Co., London, 1913. 5s. 8½ x 5½.

THE OREGON TRAIL: SKETCHES OF PRAIRIE AND ROCKY-MOUNTAIN LIFE. By F. Parkman. 4th edit. xi and 479 pp. Index. Little, Brown & Co., Boston, 1911. $2. 8½ x 5½.

Reminiscences of the Yukon. By the Hon. Stratford Tollemache. xi and 316 pp. Ills., index. E. Arnold, London, 1912. 12s. 6d. 9 x 6.

The Revolution on the Upper Ohio, 1775-77. Compiled from the Draper Manuscripts. Edited by R. G. Thwaites and L. P. Kellogg. xix and 275 pp. Map, ills., index. Wisconsin Hist. Soc., Madison, 1908. 7½ x 5½.

The Story of Slate and the Slate Industry. By G. Bleekman. 93 pp. Ills. Capital City News Syndicate, Harrisburg, Pa., 1911. $1. 6 x 9.

The Subways and Tunnels of New York. Methods and Costs. With an appendix on tunneling machinery and methods and tables of engineering data. By G. H. Gilbert, L. I. Wightman and W. L. Saunders. xiv and 372 pp. Ills., index. J. Wiley & Sons, New York, 1912. $4. 9½ x 6½.

Travels in the Confederation [1783-1784]. New Jersey, Pennsylvania, Maryland, Virginia, the Carolinas, East Florida, the Bahamas. From the German of Johann David Schcepf. Translated and edited by A. J. Morrison. Part 1: x and 426 pp. Part 2: 344 pp. Indexes. W. J. Campbell, Philadelphia, 1911. $6. 8½ x 5½.

The Wonders of the Colorado Desert (Southern California). Its rivers and its mountains, its canyons and its springs, its life and history, pictured and described. Including an account of a recent journey made down the overflow of the Colorado River to the mysterious Salton Sea. By G. W. James. xix and 547 pp. Map, ills., index. Little, Brown & Co., Boston, 1911. $2.50. 9 x 6.

ASIA

The Fall of the Mogul Empire. By S. J. Owen. xii and 271 pp. Map, index. J. Murray, London, 1912. 7s. 6d. 9 x 6.

The International Relations of the Chinese Empire. The Period of Conflict 1834-1860. By H. B. Morse. xxxix and 727 pp. Maps, ills., index. Longmans, Green & Co., N. Y., 1910.

Japan of the Japanese. By J. H. Longford. x and 314 pp. Map, ills., index. Charles Scribner's Sons, New York, 1913. $1.50. 7½ x 5½.

The Japanese in Manchuria, 1904. By E. L. V. Cordonnier. Translated by C. F. Atkinson. Vol. 1: The Yalu and Te-Li-Ssu. xi and 281 pp. Maps. H. Rees, London, 1912. 7s. 6d. 8½ x 5½.

Siam: A Handbook of Practical, Commercial, and Political Information. By W. A. Graham. 2nd edit. Map, ills., index. A. Moring, London, 1912. 10s. 6d. 7½ x 5.

Sixty Years: Life and Adventure in the Far East. By J. D. Ross. 2nd edit. Vol. 1: xv and 364 pp. Vol. 2: xi and 411 pp. Map, ills. Hutchinson & Co., London, 1912. £1 4s. 9 x 6.

Big-Game Shooting in Upper Burma. By Major G. P. Evans. 240 pp. Map, ills., index. Longmans, Green & Co., N. Y., 1911. 7s. 6d. 9 x 6.

The Pacification of Burma. By Sir Charles Crosthwaite. xii and 355 pp. Maps, ills., index. E. Arnold, London, 1912. 16s. 9 x 6.

Campaigns on the North-West Frontier. H. L. Nevill. xix and 413 pp. Maps, ills., index. J. Murray, London, 1912. 15s. 9 x 6.

The History of Caste in India. Evidence of the laws of Manu on the social conditions in India during the Third Century A. D., interpreted and examined; with an appendix on radical defects of ethnology. By Shridhar V. Kethar. Vol. 1: xv and 192 pp. Index. Taylor & Carpenter, Ithaca, N. Y., 1909. $1.50. 8 x 5½.

Indian Pages and Pictures. Rajputana, Sikkim, the Punjab, and Kashmir. By M. M. Shoemaker. xxii and 475 pp. Ills., index. G. P. Putnam's Sons, N. Y., 1912. $2.50. 8 x 6.

India and Tibet. A history of the relations which have subsisted between the two countries from the time of Warren Hastings to 1910; with a particular account of the mission to Lhasa of 1904. By Sir Francis Younghusband. xvi and 455 pp. Maps, ills., index. J. Murray, London, 1910. £1, 1s. 9 x 6.

PHYTOGEOGRAPHY AND ZOOGEOGRAPHY

THE ANIMAL WORLD. By F. W. Gamble. Home Univ. Library. xii and 256 pp. Ills., index. Henry Holt & Co., New York, 1911. 50 cents. 7 x 5.

DIE LEITENDEN GESICHTSPUNKTE EINER ALLGEMEINEN PFLANZENGEOGRAPHIE IN KURZER DARSTELLUNG. Von H. Grafen zu Solms-Laubach. ix and 243 pp. Index. A. Felix, Leipzig, 1905. 9½ x 6.

GRUNDZÜGE EINER ALLGEMEINEN PFLANZENGEOGRAPHIE. Von Joakim Frederik Schouw. Aus dem Dänischen übersetzt vom Verfasser. viii and 524 pp. G. Reimer, Berlin, 1823. 8 x 5.

SUBMERGED FORESTS. By Clement Reid. 129 pp. Index, ill. University Press, Cambridge. G. P. Putnam's Sons, New York, 1913. 40 cents. 6½ x 5.

SYLVICULTURE IN THE TROPICS. By A. F. Broun. xviii and 309 pp. Ills., index. Macmillan & Co., Ltd., London, 1912. $2.50. 8½ x 6.

DIE VEGETATION DER ERDE. Sammlung pflanzengeographischer Monographien herausgegeben von A. Engler und O. Drude. I: Grundzüge der Pflanzenverbreitung auf der iberischen Halbinsel. Von M. Willkomm. viii and 395 pp. II: Grundzüge der Pflanzenverbreitung in den Karpathen. Von F. Pax. I. Band. viii and 269 pp. III: Grundzüge der Pflanzenverbreitung in den Kaukasusländern von der unteren Wolga über den Manytsch-Scheider bis zur Scheitelfläche. Von G. Radde. xii and 500 pp. IV: Die Vegetationsverhältnisse der illyrischen Länder begreifend Südkroatien, die Quarnero-Inseln, Dalmatien, Bosnien und die Hercegovina, Montenegro, Nordalbanien, den Sandzak Novipazar und Serbien. Von G. v. Beck. xv and 534 pp. V: Die Heide Norddeutschlands und die sich anschliessenden Formationen in biologischer Betrachtung. Eine Schilderung ihrer Vegetationsverhältnisse, ihrer Existenzbedingungen und ihrer Beziehungen zu den übrigen Formationen, besonders zu Wald und Moor, in Mitteleuropa. Von P. Graebner. xii and 320 pp. VI: Der Hercynische Florenbezirk. Grundzüge der Pflanzenverbreitung im mitteldeutschen Berg- und Hügellande vom Harz bis zur Rhön, bis zur Lausitz und dem Böhmer Walde. Von O. Drude. xix and 671 pp. X: Grundzüge der Pflanzenverbreitung in den Karpathen. Von F. Pax. 2. Band. viii and 321 pp. XI: Die Vegetationsverhältnisse der Balkanländer (Mösische Länder) umfassend Serbien, Altserbien, Bulgarien, Ostrumelien, Nordthrakien und Nordmazedonien. Von L. Adamović. Maps, ills., index in each. W. Engelmann, Leipzig, 1896-1908. 10 x 7.

CURRENT GEOGRAPHICAL PAPERS

NORTH AMERICA

United States. BEALS, E. A. Forecasting Frost in the North Pacific States. 49 pp. Maps, ills. *U. S. Weather Bur. Bull. No. 41.* 1912.

BLAIR, W. R. Summary of the Free-Air Data Obtained at Mt. Weather for the 5 years, July 1, 1907, to June 30, 1912. *Bull. Mt. Weather Observ.*, Vol. 6, 1914, Part 4, pp. 111-131.

BRÜCKNER, E. Die transkontinentale Exkursion der Amerikanischen Geographischen Gesellschaft durch die Vereinigten Staaten, August bis Oktober 1912. Maps. *Mitt. k. k. Geogr. Gesell. in Wien*, Vol. 56, 1913, No. 11-12, pp. 611-651.

BUWALDA, J. P. Pleistocene Beds at Manix in the Eastern Mohave Desert Region. Map, ills. *Bull. Dept. of Geol., Univ. of California Public.*, Vol. 7, 1914, No. 24, pp. 443-464.

FEHLINGER, H. Die Küstenschiffahrt in den Vereinigten Staaten von Amerika. *Weltverkehr & Weltwirtschaft*, Vol. 3, 1913-14, No. 10, pp. 381-383. Berlin-Wilmersdorf.

McAdie, A. G. The Climate of San Francisco. 33 pp. Diagrams. *U. S. Weather Bur. Bull. 44.* 1913.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. GEOLOGICAL SURVEY

Topographic Sheets

(Including Combined and Special Topographic Maps)

California. (a) Holt Quadrangle. Surveyed in 1911. 1:31,680. 38°0′0″ - 37°52′30″ N.; 121°30′0″ - 121°22′30″ W. Contour interval 5 ft. Edition of Dec. 1913.

(b) Marysville Buttes and Vicinity. Surveyed in 1905 and 1909-1911. 1:62,500. 39°20′ - 39°5′ N.; 121°55′ - 121°40′ W. Interval 25 ft. Edit. of Nov. 1913.

(c) Stockton Quad. Surveyed in 1911. 1:31,680. 38°0′0″ - 37°52′30″ N.; 121°22′30″ - 121°15′30″ W. Interval 5 ft. Edit. of Dec. 1913.

(d) Woodward Island Quad. Surveyed in 1911. 38°0′0″ - 37°52′30″ N.; 121°37′30″ - 121°30′0″ W. Interval 5 ft. Edit. of Nov. 1913.

[Maps (a), (c) and (d) are three adjoining sheets of the two-inches-to-the-mile map of the San Joaquin-Sacramento Valley. Valuable representation of the built-up area in the city of Stockton on map (c). Map (b) is reduced from 9 sheets on the scale of 1:31,680; it is a special map whose boundaries do not coincide with those of the regular 1:62,500 sheet. As there are two other topographic sheets with a similar title it may be helpful to call attention to them: the first is the 1:31,680 sheet entitled Marysville Buttes Quadrangle, listed under "California (c)" in the *Bull.*, Vol. 45, 1913, p. 475; the second is an old 1:125,000 sheet entitled Marysville Sheet, surveyed in 1886. The present 1:62,500 sheet is the first one adequately to represent the relief of the buttes, as on the 1:31,680 sheet the contour interval changes from 5 to 500 ft. above an elevation of 300 ft.]

Idaho. Slug Creek Quad. Surveyed in 1910-1911. 1:62,500. 42°45′ - 42°30′ N.; 111°30′ - 111°15′ W. Interval 50 ft. Edit. of Dec. 1913.

Illinois. Sumner Quad.* Surveyed in 1911. 1:62,500. 38°45′ - 38°30′ N.; 88°0′ - 87°45′ W. Interval 20 ft. Edit. of Nov. 1913.

Maryland. Nanjemoy Quad.* Surveyed in 1911. 1:62,500. 38°30′ - 38°20′ N.; 77°20′ - 77°0′ W. Interval 20 ft. Edit. of Nov. 1913.

[Coextensive with the northeast corner of the old Fredericksburg, Va.-Md., sheet, 1:125,000, surveyed in 1887-88. It adjoins to the south the Indian Head sheet listed under Maryland in the February *Bull.* (Vol. 46, 1914), p. 155, and, like it, does not show topography for the Virginia portion of the sheet.]

New Mexico Alum Mountain Quad. Surveyed in 1910-1911. 1:125,-000. 33°30′ - 33°0′ N.; 108°30′ - 108°0′ W. Interval 100 ft. Edit. of Dec. 1913.

New York. Lyon Mountain Quad.* Surveyed in 1911. 1:62,500. 44°45′ - 44°30′ N.; 74°0′ - 73°45′ W. Interval 20 ft. Edit. of Dec. 1913.

Ohio. Sidney Quad.* Surveyed in 1911. 1:62,500. 40°30′ - 40°15′ N.; 84°15′ - 84°0′ W. Interval 10 ft. Edit. of Nov. 1913.

Ohio–West Virginia. Surveyed in 1900-1901. 1:62,500. 38°30′ - 38°15′ N.; 82°45′ - 82°30′ W. Interval 20 ft. Preliminary edit., Nov. 1913.

[Coextensive with the northeastern quarter of the Kenova, Ky.-W.Va.-O., 1:125,000 sheet. The western two-thirds, however, comprising Kentucky territory, are blank.]

* On these sheets woods are shown in green.

Pennsylvania. Mercer Quad.* Surveyed in 1911. 1:62,500. 41°15′-41°0′ N.; 80°15′-80°0′ W. Interval 20 ft. Edit. of Nov. 1913.

Tennessee. Hollow Springs Quad.* Surveyed in 1911. 1:62,500. 35°45′-35°30′ N.; 86°15′-86°0′ W. Interval 20 ft. Edit. of Dec. 1913.

[An excellent illustration of the fact that the contour method does not *per se* convey relative impressions of altitude. At first sight the sheet seems to represent a plain bordered by a higher mountain area to the west: only on closer inspection of the contour elevations and the drainage does it appear that the plain is a plateau and the mountain area its western dissected margin (incidentally the western border of the Appalachian Plateau).]

United States. [Contour Map of the] United States. 1:2,500,000. 52°-24° N.; 129°-65° W. 2 colors. With inset: Alaska. [1:11,000,000]. 1 color. In 9 sheets. U. S. Geological Survey, Washington, D. C., 1913.

[The publication, in a new edition, of this standard contour map of the United States is an event of importance. The last previous edition was published in 1898, although editions of the same map, without the important element of relief, however, have appeared recently. The only recent general maps of the United States with relief published by the Survey have been the contour and the hypsometric map, 1:7,000,000 (see *Bull.*, Vol. 44, 1912, p. 399, under "United States," b and c) which are not comparable with the present map, however, because of their much smaller scale. The extent of new surveys made in the fifteen years since the publication of the previous edition has led to a redrawing of the contours over practically all of the map, as a comparison with the 1898 edition will show: even such older portions of the country as New York and Pennsylvania are affected. Up to 2,000 ft. the contour interval is 500 ft. (except that the 100 ft. contour is shown); above that elevation, 1,000 ft. The fact that the contours are drawn more delicately than on the previous edition makes for greater plasticity on the whole. Thus the Sierra Nevada stands out much better. The omission of color on the water surfaces is a slight disadvantage, probably justified, however, by the decreased cost due to the elimination of one color plate. The publication of the map in 9 instead of 3 sheets, as previously, makes it much easier to consult. As before, the map shows, in black, county boundaries and names, towns and railroads. While this map is unquestionably the best general map of the United States at present published by a government bureau (the General Land Office map is about the only other to come into consideration) it may be questioned whether the contour method is the best to represent relief on a general map. While fully recognizing its appropriateness for a detailed survey the reviewer's opinion is that hachuring renders relief far more adequately on a general map. Good examples are the admirable map of the United States in Vivien de St. Martin and Schrader's Atlas Universel de Géographie, 1:5,000,000 (Hachette et Cie., Paris, 1908) and the map on the same scale in Andree's Handatlas (5th edit., Velhagen und Klasing, Leipzig, 1906). That this view has been held by others is attested by the various maps published during the classic period of exploration by the Army engineers, notably Lieut. G. K. Warren's map of the western United States, 1:3,000,000.]

NORTH AMERICA

Canada

Canada, etc. (a) Canada: Orographical Features and Railways. 1:17,000,000. 75°-40° N.; 158°-35° W. 8 colors.

(b) Canada: Economic Development. 1:17,000,000. 75°-40° N.; 158°-35° W. 8 colors.

(c) North American Colonies, 1755-1763. [1:18,000,000]. 64°-36° N.; 100°-50° W. 5 colors.

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* On these sheets woods are shown in green.

(d) British North America, 1791. [1:18,000,000]. 59° - 40° N.; 100° - 50° W. 4 colors.

(e) Canada: Density of Population. [1:23,000,000]. 68° - 40° N.; 145° - 50° W. 6 colors.

Accompany "The Dominion of Canada: A Study in Regional Geography" by A. S. White, *Scottish Geogr. Mag.*, Vol. 29, 1913, pp. 524-547 and 565-580, as follows: maps (a) and (b) facing p. 564, map (c) facing p. 526, map (d) facing p. 528, and map (e) facing p. 576.

[Map (a) a helpful hypsometrical map (six tints) showing the main transcontinental railroads in red and accompanied by a profile across the country. Map (b) is a suggestive economic map differentiating between (1) industrial districts, (2) present agricultural lands, (3) lands likely to be opened up for agriculture in the near future, (4) present grazing lands, (5) present forest lands and (6) fisheries, and also showing the occurrence of gold, silver, coal and iron. Maps (c) and (d) are historical maps offering nothing new. Map (e), besides distinguishing between five population density grades, shows the territory settled since 1901. It brings out well that practically only the southern margin of Canada is settled.]

United States

United States. United States West of the Mississippi River, Mexico and Part of the Dominion of Canada and Central America. Compiled under the direction of the Southern Pacific Company and corrected to June 30, 1909. 1:1,267,200. 57⅔° - 13½° N.; 132° - 78° (in middle of right border 85°) W. Copyrighted, 1910, by Southern Pacific Co. Photo. Lith. Britton & Rey, S[an] F[rancisco]. In 18 sheets. [Gift from Wm. Hood, Chief Engineer, So. Pac. Co.]

[A valuable map on a relatively large scale showing exhaustively all the railroads existing at the time of publication within the territory represented. This extends from Portland Canal, Reindeer Lake and James Bay on the north to Salvador on the south and from the Pacific on the west to James Bay, Indiana, Alabama, and British Honduras on the east. The large scale of the map is brought out by its size, which is about 13 by 9 feet. Such a map is especially valuable because of the relative inaccessibility of the material which it presents, as those who have sought detailed authentic information as to the routes of American railroads will realize. Where no topographic sheets exist or where these are out of date the only recourse one has is to the state maps published by the General Land Office, or the post route maps published by the Post Office Department, or again to the maps published by the state railroad commissions. But some of these are not very carefully drawn, others, such as the Post Office maps, are rather expensive, and all of them do not present a consecutive picture of a large part of the country. The present map fulfills this need, a need which the engineering departments of the large railroad systems have felt and thus satisfied. The routes of all lines are shown accurately with all curves, and every station is indicated. Otherwise the map shows the locational element only—rivers, towns, county and state boundaries—except for part of Mexico where relief is shown very effectively in black hachuring, generalized from the topographic sheets, so far as published, of the Comisión Geografico-Exploradora.]

ASIA

Turkey in Asia-Persia. Aufnahmen in Armenien und Kurdistan von Oberleutnant Graf von Westarp, 1912. 1:500,000. [In three parts:] I. Ersindjan-Mamachatun. 39°55′ - 39°10′ N.; 39°10′ - 40°30′ E. 2 colors. II. Erserum-Musch. 40°0′ - 38°43′ N.; 41°0′ - 41°25′ E. 2 colors. III. Bitlis-Urmia-Täbris. 38°45′ - 37°15′ N.; 42°0′ - 46°25′ E. 3 colors. With inset: Übersicht zu Graf Westarps Aufnahmen in Armenien und Kurdistan. 1:15,000,000. 44° - 33° N.; 30° - 52° E. 3 colors. Accompanies, as Taf. 48, "Routenaufnahmen in Armenien und Kurdistan" by von Westarp, *Petermanns Mitt.*, Vol. 59, II, 1913, Dec., pp. 297-300.

Turkey in Asia. Der Hauptteil des Vulkangebietes von Kula (Lydien), der Katakekaumene der Alten. Nach topographischen und geologischen Aufnahmen im Jahre 1901 von Alfred Philippson. 1:50,000. 38°39′ - 38°31′ N.; 28°30.1′ - 28°47.1′ E. 12 colors. With two insets: (1) Lageplan des Vulkangebietes von Kula. 1:500,000. 38°45′ - 38°17′ N.; 28°10′ - 28°50′ N. 3 colors. (2) Übersicht der Lage von Kula. 1:5,000,000. 41⅜° - 37½° N.; 23° - 30° E. 3 colors. Accompanies, as Taf. 40, "Das Vulkangebiet von Kula in Lydien, die Katakekaumene der Alten" by A. Philippson, *Petermanns Mitt.*, Vol. 59, II, 1913, Nov., pp. 237-241.

[Detailed geological map of a recent volcanic (*katakekaumene* sc. *gê*=burned land) region in the upper Hermos valley which Prof. Philippson investigated in the course of his exploration of western Asia Minor (see under "Asia Minor," *Bull.*, Vol. 43, 1911, pp. 548-549). The detailed description of this region will appear in the forthcoming fourth number of his "Reisen und Forschungen im westlichen Kleinasien."]

EUROPE

Russia. Map of European Russia. Originally compiled by Prof. E. J. Petri; second revised edition prepared under the editorship of J. M. Schokalsky. 1909. 1:2,000,000. 72° - 36° N.; 10° - 77° E. 5-12 colors. With 9 insets: (1) Hypsometrical Map of European Russia. 1:20,000,000. 16 colors. On Plate 15 (see below). (2) Agriculture, Industries and Mineral Resources of European Russia. 1:20,000,000. 17 colors. On Plate 23. (3) Density of Population of European Russia. 1:18,000,000. 13 colors. (4) Southern Coast of Crimea. 1:1,000,000. 8 colors. (5) Density of Population of the Russian Empire. 1:25,000,000. 17 colors. All three on Plate 27. (6) St. Petersburg and Environs. 1:250,000. 9 colors. (7) Moscow and Environs. 1:250,000. 7 colors. Both on Plate 28. (8) Part of the Eastern Coast of the Black Sea. 1:1,000,000. 6 colors. (9) Baku and Environs. 1:500,000. 6 colors. Both on Plate 29. In 16 sheets, constituting Plates 15 to 30 of A. F. Marks's New Reference Atlas, St. Petersburg, 1909. [In Russian.] [Gift from Gen. J. M. Schokalsky.]

[An excellent general map of European Russia on a relatively large scale. The atlas of which these 16 sheets form a part is a Russian edition of Debes's Neuer Handatlas, printed in Germany with Russian nomenclature. These 16 sheets, however, are engraved and printed in St. Petersburg; in execution they almost approach in excellence the admirable German sheets of the atlas. Relief is in brown hachuring, water features in various shades of blue, bathymetric coloring being used on the sheets including portions of the sea. Railroads are in red, making for great legibility. Several kinds of roads are shown, and there is a great number of symbols distinguishing between various types of boundaries, the seats of various administrative authorities, etc. Each sheet has an index on the reverse showing the arrangement of the whole map. For the person familiar with Russian this is the best detailed general map of the country to consult; those unfamiliar with the language must still rely on the second best map of the same type, the 6-sheet map of Russia on the scale of 1:3,700,000, forming Plates Nos. 44 to 49 of Stielers' Hand-Atlas (9th edit., Perthes, Gotha, 1905).]

Scotland. Plant Ecology of Ben Armine District. [1:21,500]. [58°12′ N. and 4°12′ W.] 11 colors. Accompanies "The Plant Ecology of Ben Armine (Sutherlandshire)" (first part) by C. B. Crampton, *Scottish Geogr. Mag.*, Vol. 29, 1913, No. 4, pp. 169-192.

[Detailed study of a peak in the highlands: eight plant formations and the critical elements of the physical geography of the district are shown.]

POLAR

Antarctic. (a) Preliminary Map Showing Sphere of Action of British Antarctic Expedition, 1910-13. [1:6,000,000]. 70° - 90° S.; 140° E. - 140° W. With inset of Antarctic regions, [1:90,000,000].

(b) Track Chart of Main Southern Journey, British Antarctic Expedition, 1910-13. [1:4,000,000]. 77° - 90° S.; 140° E. - 110° W.

(c) Map of the Region Traversed on the Western Journeys, 1911 and 1912. From surveys by Griffith Taylor, B.Sc., B.E., B.A., F.G.S., Frank Debenham, B.A., B.Sc., & Charles Wright, B.A. [1:362,000]. 76°46′ - 78°30′ S.; 160°10′ - 166°0′ E. 2 colors.

(d) Sketch Map to Illustrate Journeys of the Western Geological Parties. [1:1,450,000]. [76¾° - 78½° S.; 160° - 170° E.]

(e) Sketch Map of McMurdo Sound. [1:420,000]. 77°23′ - 78°6′ S.; 163°20′ - 169°10′ E.

(f) [Ross Island showing] Track of Journey from Cape Evans to Cape Crozier, June 27th to August 1st, 1911. [1:460,000]. [77½° S. and 168° E.].

(g) Sketch Map of Mount Erebus showing routes of ascent, from plane table map by F. Debenham. [1:170,000]. [77°30′ S. and 167°15′ E.].

(h) Map to Show the Northern Party's Travels. [1:4,230,000]. 70° - 78° S.; 160° - 175° E. With two insets: (1) [Robertson Bay]. [1:800,000]. [71½° S. and 170° E.]. (2) [Terra Nova Bay]. [1:800,000]. [74½° S. and 164° E.].

(i) Tracks of the "Terra Nova," 1910-11, 1911-12, 1912-13. [1:9,600,000]. 60° - 80° S.; 150° E. - 150° W.

(j) Tracks of S. Y. "Terra Nova," January to March, 1912. [1:2,650,-000]. 74° - 78° S.; 162° - 171° E.

Accompany "Scott's Last Expedition," 2 vols., New York, 1913, as follows: map (a), Vol. II, facing p. 346; (b), Vol. I, facing p. 418; (c), Vol. II, facing p. 198; (d), Vol. II, facing p. 190; (e), Vol. I, facing p. 80; (f), Vol. II, facing p. 50; (g), Vol. II, facing p. 244; (h), Vol. II, facing p. 122; (i), Vol. II, facing p. 278; (j), Vol. II, facing p. 274.

[Maps (a) and (b) are general maps showing the topography respectively between Cape Adare and the South Pole and Ross Island and the South Pole; relief is in hachuring and the routes of the various parties are shown. Map (c) is of great value as it represents a detailed study of the glaciers debouching from the Antarctic ice cap on the western side of McMurdo Sound. It illustrates Griffith Taylor's contribution to the physiography of the region (Vol. II, pp. 124-198 and 285-294). The nomenclature of the map perpetuates the names of numerous modern investigators, e. g., Davis, Walcott, Hobbs, and Suess. Relief is in contours, blue on the glaciers, black elsewhere. Map (d) is a small sketch map of the same region indicating exposed rock surfaces and moving glaciers. Maps (d), (f) and (g) present various details in the vicinity of McMurdo Sound. Map (h) is a general map of the northern part of Victoria Land with insets of the vicinity of Cape Adare and of Terra Nova Bay. Maps (i) and (j) show the track of the *Terra Nova*, the former covering the region south of 60° S.]

Other Maps Received

NORTH AMERICA

United States-Canada. Stanford's Railway Map of the United States and Part of Canada, showing the principal railways quoted in the Stock Exchange daily official list. 1:5,274,720. Edw. Stanford, Ltd., London, 1913.

Canada

Ontario. Wagon Road Map of Eastern Ontario. 6 mi. to 1 in. The Mission Book Co., Ltd., Toronto, 1900.

United States

Western United States. Part of United States west of Mississippi River, prepared under direction of I. P. Berthrong, Chief of Drafting Division, G. L. O. [27 mi. to 1 in.] General Land Office, Washington, 1914. 15 cents.

AFRICA

Abyssinia. [Lago Tsana]. 1:600,000. Ministero delle Colonie, Direzione Central degli Affari Coloniali per l'Eritrea e la Somalia. [Roma], 1913.

British East Africa, etc. Schizzo dimostrativo dell'Africa orientale Inglese. 1:4,000,000. Ministero delle Colonie, Direzione centrale degli Affari Coloniali. [Roma], 1912.

Egypt. [Topographic map of] Egypt. 1:50,000. Sheets: III-III N. E. Zagazig. IV-V N. E. Qassasin el Sharq. IV-II N. E. Mît Ghamr. V-III N. E. Abu el Sheqûq. V-II N. E. Simbellawein. VI-I N. E. Biala. V-V N. E. El Managât. VI-III N. E. Dekernes. VI-II N. E. Mansûra. VI-V N. E. Matarîa. VI-IV N. E. Manzala. VIII-IV N. E. Damietta. VII-IV N. E. Lake Manzala West. X-I S. W. Minia. IX-I S. W. Gebil el Teir. XII-II S. W. Dalga. XI-II S. W. Balansûra. Survey Department. [Giza], 1911-13.

[For arrangement of sheets see under "Egypt (b)," *Bull.*, Vol. 44, 1912, p. 559.]

Eritrea-Abyssinia, etc. Colonia Eritrea: Schizzo dimostrativo delle vie di communicazione con l'Etiopia e con il Sudan e zona d'influenza commerciale. Compilato da M. Checchi. 1:4,000,000. Direzione Centrale degli Affari Coloniali. [Roma, 1913].

French Equatorial Africa. [Four charts of the lower Ogowe River:] (1) Baie du Cap Lopez. Mouillage de Mandji et Embouchure de l'Ogooué. Plan levé en 1911. 1:30,000. (2) Estuaire du Gabon. Mouillage de la Pte. Owendo. Plan levé en 1912. 1:5,000. (3) Lagunes N'Dogo. Simba et Sunga. 1:100,000. Croquis dressé d'après les reconnaissances effectuées d'Août à Septembre 1911. Insets: Passe de l'Ile M'Bottio, 1:10,000; Entrée de la Lagune Sunga, 1:10,000; Profil de l'Isthme N'Dama Niungu. (4) Bas-Ogooué. Croquis effectués du 20 Septembre au 3 Octobre 1911. 1:50,000. Mission Hydrographique du Gabon.

[Chart of the lower Congo River]. 1:50,000. Feuille 1, de Léopoldville au Couloir (Stanley-Pool); Fle. 2, Du Stanley-Pool à la Rivière Noire; Fle. 3, De la Rivière Noire à la Rivière Léfini; Fle. 4, De la Rivière Léfini à Bolobo; Fle. 5, De Bolobo à la Rivière Alima; Fle. 6, De la Rivière Alima à la Rivière Sanga; Fle. 7, De la Rivière Sanga à Irébou; Fle. 8, D'Irébou à l'Oubangui. Reconnaissance hydrographique effectuée en 1911 par la Mission Congo-Oubangui-Sanga.

[Chart of the] Oubangui de Mongoumba à Bangui. 1:10,000; insets 1:5,000. Fle. 1, De Mongoumba à la Lobaye. Inset: Passage des Roches Mapoute. Fle. 3, De la Pointe Sud de Beauséjour à la Pointe Nord de l'Ilot Edouard. Insets: Passage des Roches du Pigeon; Passage de l'Aiguille. Fle. 4, De l'Ile Édouard à la Pointe Nord de l'Ile de la Lessé. Inset: Passage de Cétia. Fle. 5, De l'Ile de la Lessé à l'Ile Papillon. Inset: Passage des Hippos. Fle. 6, De l'Ile Papillon à l'Ilot Maurice. Inset: Passage de Botombeké. Fle. 7, De l'Ilot Maurice au Village de Mombasa. Insets: Passage de Mombasa; Passage de Mokero. Fle. 10, De Bimbo à Bangui. Inset: Passage du Roche Félix. Fle. 11, De la Lobaye à la Pointe Nord de l'Ile Ouest. Inset: Le Plateau du Milieu. Mission Hydrographique Congo-Oubangui, 1912.

[Chart of the] Oubangui. 1:50,000. Feuille 1, Du Congo à Balhois; Fle. 2, De Balhois à Impfondo; Fle. 3, D'Impfondo à Bongondo; Fle. 4, De Bongondo à Bétou. Reconnaissance hydrographique effectuée en 1911 par la Mission Congo-Oubangui-Sanga.

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Juin à Septembre 1911. 1:20,000. (4) Passe Française du Stanley-Pool. Plan levé en Août et Septembre 1911. 1:20,000. (5) Plan de Brazzaville levé et dessiné de Juin à Septembre 1911. 1:5,000. Mission Hydrographique Congo-Oubangui-Sanga.

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Switzerland. [Thirteen plans of Swiss cities:] (1) Plan von Baden und Umgebung. 1:25,000. Inset: Plan von Baden, 1:12,000. 8. Auflage. (2) Plan der Stadt Basel, mit Strassen-Verzeichnis. 7. Auflage. 1:11,000. (3) Plan der Stadt Bern. mit Strassen-Verzeichnis. 1:10,000. 2. Auflage. (4) Plan der Stadt Chur, mit Strassen-Verzeichnis. 1:3,500. (5) Plan de Fribourg, avec nomenclature des rues. 1:7,500. (6) Plan de Genève et de ses Environs, avec nomenclature des rues. 3e édition. 1:12,000. (7) Plan de Lausanne, avec nomenclature des rues. 4e édition. 1:9,000. (8) Plan der Stadt Luzern, mit Strassen-Verzeichnis. 1:6,500. (9) Plan de Neuchâtel, avec nomenclature des rues. 2e édition. 1:10,000. (10) Plan von Schaffhausen mit Neuhausen und Rheinfall, mit Strassen-Verzeichnis. 1:10,000. (11) Plan der Stadt St. Gallen, mit Strassen-Verzeichnis. 4. Auflage. 1:6,000. (12) Plan der Stadt Winterthur und Umgebung, mit Strassen-Verzeichnis. 1:9,000. (13) Plan der Stadt Zürich, mit Strassen-Verzeichnis. 27. Auflage. 1:12,000. Published by Art. Institut Orell Füssli, Zürich. Price, 50 centimes each.

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BROADWAY AT 156TH STREET

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BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

Vol. XLVI	1914	No. 6

POPULATION ESTIMATES FOR THE COUNTRIES OF THE WORLD FROM 1914 TO 1920

By MARK JEFFERSON
State Normal College, Ypsilanti, Mich.

What is the present population of the United States? Over 100 millions. *How do you know? The last census gave it but 92.* Well, that was four years ago, and we have grown since then. *Yes, of course, but are you not guessing when you get away from the official census-figures?* In a sense, yes, but it is quite certain that our population did not stop growing in 1910 and that 92 million is *not* our present population. *May be, but we shall not know till 1920 how fast we have grown. In the meantime all that we know is that it is larger than 92 million.* No: there are really other reliable sources of information beside the census. We really *knew* in the early months of 1910, before the census had been taken, that the United States had grown. If the officials of that census had declared as their result that the country had lost people since 1900, we should have been quite justified in questioning their work. For, while it is true that the only way to ascertain the number of a people is to count them, the *increase* or *diminution* of population can be read by far easier signs, the plainest signs of increase being the active building of houses, the crowding of schools, the coming of immigrants, and the general activity of commerce in food and clothing.

All countries in the world that have a regular census show an unfailing growth of population—even through great wars like our

Civil War and the Franco-German War of 1870—excepting only India between 1861 and 1871 and Ireland, if Ireland can be called a country. British and American statistics have long made the exodus of the Irish to America familiar. British India had a population in 1861 of 196 millions, which ten years later had become 195.8 millions, a small but distinct loss of people. But in these two cases *other knowledge than that derived from the census* gives an adequate explanation. Famines in India are so notorious that one is astonished to learn that that is the only decade in which the Indian population did not increase and that in that one it diminished so little. Humanely speaking, the diminution of population by 200,000 is an appalling disaster; numerically it is a slight part of 196 millions and only striking because normally that country should increase by a million or two a year. Growth of population is so sure and normal in all countries that it habitually masks the losses from war and famine.

But not merely is growth normal to all modern nations, but that of the United States has long been known to be unusual and abnormally great. Anyone who is not familiar with the fact, if there be anyone, might glance at the graphs for population growth on Plate 14 of the Statistical Atlas of the United States for 1900. Moreover, the manner and the reasons for the extraordinary growth of the United States are well known. There is no need to enlarge on a thing so familiar; it suffices to state briefly that our birth rate, though dwindling, is still greater than our death rate, and a great flood of European immigration has set our way for more than half a century. Of those who come more than half a million now stay with us each year. Quite independently of the census figures of 1910, we may say we know beyond any doubt that our population is increasing quite as rapidly as it did from 1900 to 1910. In all probability it is increasing faster.

Generally it is safe to say that a country will increase as rapidly in a new decade as it has in the past, unless some widespread and mighty cause prevents, which, to be operative, must be of sufficient magnitude to be matter of universal knowledge. In face of the fact that all countries are growing and that our growth is much greater than that of other nations, it is clear that only some calamity greater than the Civil War could have given us a smaller population in 1910 than we had in 1900. On the other hand it is quite inadmissible to keep on using the figures of one census until they are replaced by those from the next one.

The simplest way to make such estimates as those shown in the following tables is to construct diagrams of growth of population for the decade 1900-1910 and extend the line to 1920. The appended diagram (Fig. 1) shows such population graphs for the United States and the United Kingdom for the last five decades. The extension of the line of each decade allows comparison of such estimates with the facts since ascertained by census counts. The estimates of the tables are readings for the several years on such graphs.

Let me disclaim any intention of prophecy. *To-day* the tabular value for any country is a fair ground for stating that the population in that country is now greater than that number. Whatever we know about the events of that country since 1910 must assist us in judging how much greater. To take the value for 1920 from the table now and say that in that period, after six years of whose course we can yet know nothing, the population *will be* so and so, is to misuse it. *If population grows just as in the last decade,* we shall have those figures for the facts of 1920; but that is not at all likely, though not so far from likely as that population anywhere will remain unchanged.

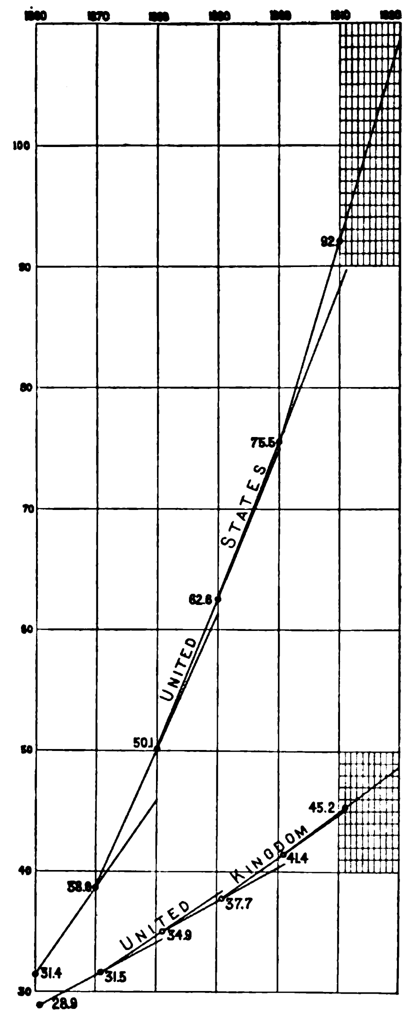

FIG. 1—Diagram showing the growth of population of the United States and the United Kingdom from 1860 to 1920. The vertical divisions represent periods of ten years; the horizontal divisions, millions of population. The population at each census is given opposite the small circle which represents it on the line of population growth. The line for each decade is extended beyond its period to allow of comparison with the actual growth. The line for 1910-1920 represents estimated growth on the basis of previous growth.

TABLE I. ESTIMATED POPULATION OF AMERICA IN MILLIONS FROM 1914 TO 1920

	1914	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*
Newfoundland	.2	.2	.2	.2	.2	.2	.2
United States	98.5	100.2	101.9	103.5	105.1	106.9	108.4
Canada	7.7	7.9	8.1	8.3	8.5	8.6	8.8
Mexico	15.8	15.9	16.1	16.3	16.4	16.6	16.7
Guatemala	2.1	2.2	2.2	2.3	2.3	2.4	2.4
Salvador	1.2	1.2	1.2	1.3	1.3	1.3	1.4
Nicaragua	.6	.7	.7	.7	.7	.7	.7
*Honduras	.5	.5	.5	.5	.5	.5	.6
Panama	.4	.4	.5	.5	.5	.5	.5
Costa Rica	.4	.4	.4	.4	.4	.4	.4
NORTH AMERICA	127	130	132	134	136	138	140
Bahamas	.06	.07	07	.07	.07	.07	.07
E. British Antilles	.8	.8	.8	.8	.8	.8	.8
Jamaica	.9	.9	.9	.9	.9	.9	.9
*Haiti-Santo Domingo	3.2	3.3	3.4	3.4	3.5	3.6	3.6
French Antilles	.4	.4	.4	.4	.4	.4	.4
Cuba	2.4	2.4	2.5	2.6	2.6	2.6	2.7
Porto Rico	1.2	1.2	1.2	1.2	1.2	1.2	1.2
WEST INDIES	9	9	9	9½	9½	9½	9¾
British Guiana	.3	.3	.3	.3	.3	.3	.3
French Guiana	.05	.05	.05	.05	.05	.05	.05
Dutch Guiana	.08	.08	.09	.09	.09	.09	.09
*Colombia	4.4	4.4	4.5	4.5	4.5	4.5	4.6
*Venezuela	2.8	2.8	2.8	2.8	2.8	2.9	2.9
*Ecuador	1.5	1.6	1.6	1.6	1.6	1.6	1.6
*Peru	2.8	2.9	2.9	2.9	2.9	2.9	2.9
Brazil	18.5	18.7	19.0	19.3	19.6	19.9	20.1
*Paraguay	.8	.8	.8	.8	.8	.8	.9
*Bolivia	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Chile	3.4	3.4	3.5	3.5	3.5	3.6	3.6
Argentine Republic	7.8	8.0	8.3	8.4	8.6	8.8	9.0
Uruguay	1.1	1.1	1.1	1.1	1.1	1.1	1.2
SOUTH AMERICA	46	46½	47	47½	48	49	50
ENGLISH AMERICA	106½	108½	110	112	114	116	117½
COLONIAL AMERICA	6—	6—	6	6	6	6	6⅛
LATIN AMERICA	70	71	72	73	74	75	75⅛
AMERICA	182	185	188	191	194	197	199½

* Starred values are less reliable.

The accompanying diagrams (Figs. 2 to 5) show the recorded population growth of all the principal countries of America from 1880 to 1910 and their estimated growth from 1910 to 1920. The values in Table I are taken from this second part of the diagrams.* In addition to the estimates for each American country, summed data are given in the tables, and the corresponding curves shown on the diagrams, for North America, South America and the West Indies, and also for English America, Colonial America and Latin America—three essential classifications of American peoples.

English America includes Newfoundland, Canada and the United States. The people are typically of pure European race. They cut

* Figures 2 to 5 were originally intended to accompany an earlier paper by the author dealing only with the population estimates for America. When it was expanded into its present form the figures in Table I were revised; they may, therefore, not always tally strictly with the diagrams (*e.g.*, Cuba, Fig. 3).—ED.

the forests, till the soil, man the factories, invent, buy, sell, cultivate the arts, practice the professions, and govern themselves, without having any permanent peasant class or peasant occupations, which is still more important.

Colonial America embraces British Honduras and the Guianas, Jamaica, the Bahamas, Guadeloupe and Martinique, the east British Antilles (by which are meant mainly St. Kitts, Nevis, Montserrat, Antigua, Dominica, St. Vincent, Grenada, the Grenadines, Tobago, Barbados and Trinidad), together with the independent island of Haiti-Santo Domingo. The people are typically descendants of African slaves, a small, very small minority of white Europeans being sent from the Old World to the higher governing positions. The government is strong and orderly, but it is not self-government. The mass of the people are peasants. They do all the labor but have little to do with art or science or even industry or commerce, which are in a backward state. Haiti and Santo Domingo are not strictly in this class, as they have no European overlords, but the mass of the people belong to the same type. Only the European masters are lacking, whom they threw off long ago. Now they may be said to enjoy local misgovernment. Their governments are neither strong nor orderly.

Latin America consists of Mexico, Central America, Cuba and Porto Rico, and all of South America except the Guianas. It is inhabited in part by Spanish- or Portuguese-American creoles—who claim to have only traces of Indian blood—and in much greater part by native American races or half-breeds. These constitute a true peasant class, which performs all the heavy labor now, just as it did before the Europeans came. Neither law nor fixed custom bars them from participation in the government, yet as a general thing the mass of them have no part in it.

The presence of nearly 10 million blacks in the southern United States (as also in Brazil and Cuba) is not typical of English America but exceptional, giving their region a special character, socially and economically. The blacks are not increasing as fast as the southern whites, nor even as the whites of the whole country. This appears in part from the curves on Figure 2. The blacks now number 10 millions, the whites 86, but unlike the whites, the blacks increased more slowly in the last decade than in the previous one. They were a seventh of the population in 1880, in 1910 less than a ninth.

Of English Americans in 1914 there are over 106 millions, of

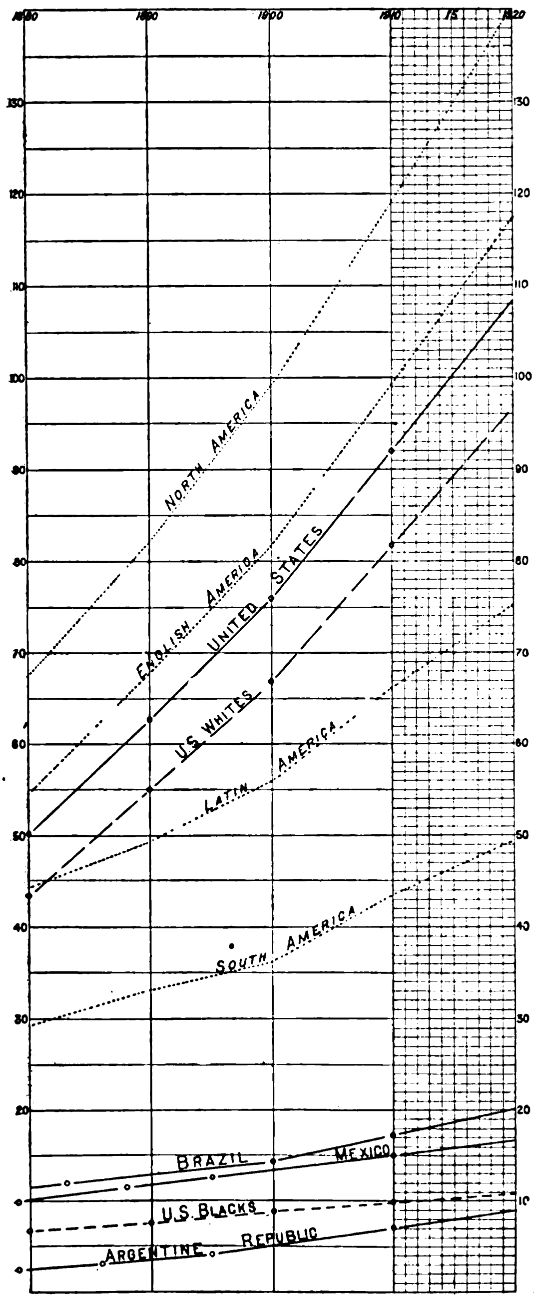

Fig. 2—Diagram showing populations for 1880, 1890, 1900, and 1910, by solid lines, of the United States, Brazil, Mexico and the Argentine Republic; by broken lines, of United States whites and United States blacks; and by dotted lines, of North America, English America, Latin America and South America. All lines are continued straight on to 1920, the right hand vertical line of the diagram, the horizontal lines representing millions of people. For the last decade lines are drawn for every year and for every million people. The small circles represent census years.

Colonials 6, and of Latins 70. Almost all are small nations except the United States, Brazil with 19 millions, Mexico with hardly 16, thanks to years of revolution, and the Argentine Republic with 8, now beginning to surpass Canada in population.

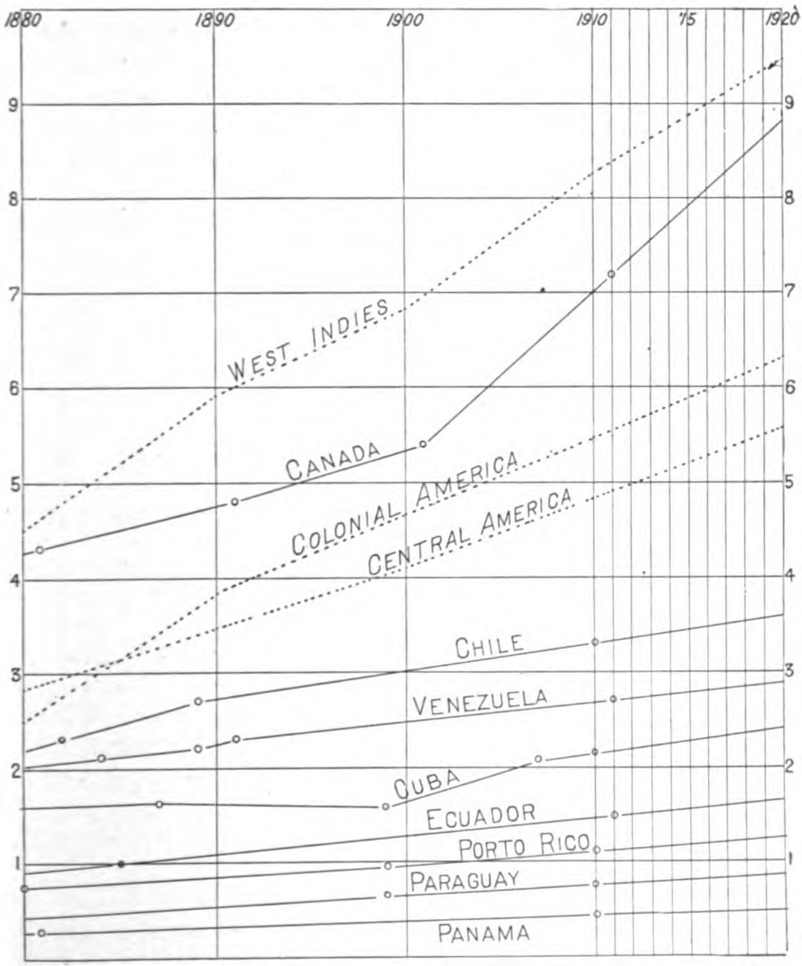

FIG. 3—Diagram showing the growth of population, from 1880 to 1920, of Canada, Chile, Venezuela, Cuba, Ecuador, Porto Rico, Paraguay, Panama and, in dotted lines, of the West Indies, Colonial America and Central America. The symbols are the same as in Fig. 2.

The data from different countries differ greatly in reliability. In English and Colonial America, excepting always Haiti and Santo Domingo, census counts are made of excellent quality. In a good part of Latin America censuses in our sense of the word are said to

be unknown. What is used is an enumeration by local authorities, a sort of summation of local estimates. In the Argentine Republic, Uruguay and Chile the figures are felt to be valuable and approximately correct. In Peru or Ecuador we have little more than opinions. A "census" was taken in Peru in 1876, with the result of a population of 2,699,945. At present the London Stock Exchange calls it 4,000,000, while "the Peruvian government are of opinion that the population is under 3,000,000." People on the spot question whether the population is growing much. The line representing Peru in Figure 4 will be seen to take into account the one census

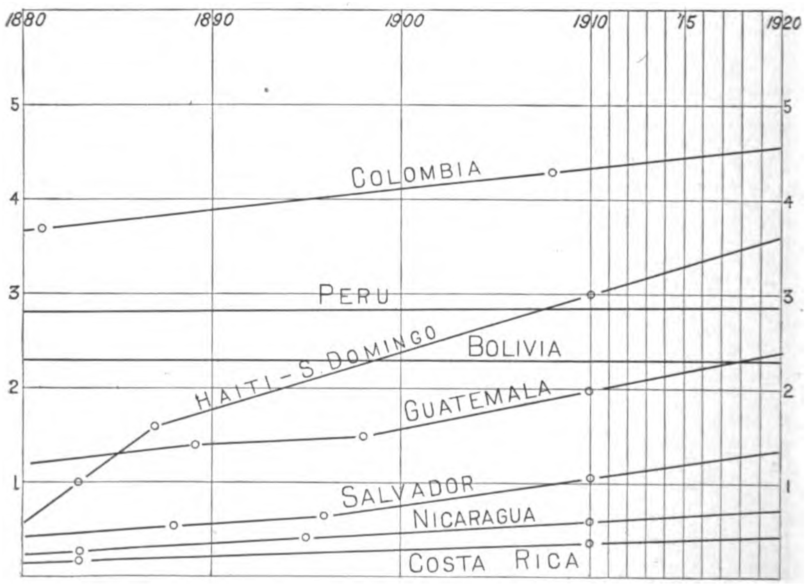

FIG. 4—Diagram showing the growth of population, from 1880 to 1920, of Colombia, Peru, Haiti-Santo Domingo, Bolivia, Guatemala, Salvador, Nicaragua, and Costa Rica. The symbols are the same as in Fig. 2.

and the government opinion. This makes the population 2.71 million in 1880 and 2.83 in 1910, by the assumption of a very slow growth. In every case all known estimates were plotted, the chief authorities being Supan's *Bevölkerung der Erde* and the *Statesman's Yearbook.*

The line for Haiti-Santo Domingo on Figure 4 is interesting as showing a very suspicious rapidity of increase. The same remark applies to Ecuador on Figure 3. In neither case is there anyone disposed to vouch for the data. For Honduras successive estimates were so discordant that a gentle increase was assumed and a line

drawn about midway among the plotted points (Fig. 5). Possibly better values for Haiti and Ecuador would have been obtained in the same way, assuming the first to range from 1.2 to 1.5 millions in the four decades and the second from 1.5 to 2.

It is true for some of these countries that the population is guessed at. It is *not* true that one guess is as good as another, as Minister Rockhill showed for China long ago.

There is no necessity that all these population lines must always rise. A country may diminish in population. Cuba claims to have done so just before the Spanish war, as the line for Cuba on Figure 3 shows. Paraguay, too, has long had a tale to tell of heavy population losses in her war, but many of her oft-cited figures are now questioned. The best counted countries do not show losses.

In Table I an asterisk marks the countries where there is least knowledge. As the unit of the whole inquiry is a million people, British Honduras and the Dutch and Danish West Indies are too small for inclusion. Roughly I believe the probable error of the estimates may be about five per cent. for Latin America and two for the totals of America. On the diagrams the numbers are plotted to the nearest ten thousand, but only the hundred thousands are given in the table as even that appears to claim too much exactitude.

TABLE II. ESTIMATED POPULATION OF EUROPE IN MILLIONS FROM 1914 TO 1920

	1914	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*
*Albania	.9	.9	.9	.9	.9	.9	.9
Austria-Hungary	50.7	51.2	51 5	51.9	52.4	52.7	53.1
Belgium	7.8	7 8	7.9	8 0	8 1	8.2	8.2
*Bulgaria	4.8	4.8	4 8	4.9	4.9	4.9	4.9
Denmark	2.9	2.9	2.9	2.9	2.9	2.9	2.9
France	39.7	39.8	39.8	39.9	40 0	40.1	40.2
German Empire	68.1	69.0	69.7	70.6	71.5	72.4	73.2
*Greece	4.6	4.6	4.7	4.7	4.8	4.8	4.8
Italy	35.3	35.6	35.7	36.0	36.2	36.4	36.6
*Montenegro	.5	.5	.5	.5	6	.6	.6
Netherlands	6.1	6.2	6.3	6.3	6 4	6 4	6.5
Norway	2.5	2.5	2.5	2.5	2.5	2.6	2.6
Portugal	5.6	5 6	5.7	5.7	5 7	5.7	5.7
*Rumania	7.6	7.7	7.9	8.0	8.1	8.2	8.3
*Russia in Europe	148.2	150.5	152.8	155.0	157.4	159.5	161.8
*Servia	4.3	4.4	4.4	4.5	4 5	4.5	4.6
Spain	20.0	20.1	20.2	20.3	20.4	20.5	20.6
Sweden	5 7	5.7	5.8	5.8	5.8	5.9	5.9
Switzerland	3.8	3.9	3.9	4.0	4.0	4 1	4.1
*Turkey in Europe	1.6	1.6	1.6	1.6	1.6	1.7	1.7
United Kingdom	46.2	46.7	46.9	47.2	47.6	47.8	48.2
EUROPE	467	472	476½	481	486	491	495½

* Starred values are less reliable.

European statistics in general are good and these estimates are probably quite close to the truth. Of Turkey there is, of course, little known. Our values for the whole Balkan region are based on

W. L. G. Joerg's careful study[1] in the *Bulletin* for November, 1913, the rate of increase being taken about as in the same part of Europe during the previous decade. For Russia, the only "census" was made in 1897, but official estimates are often made. The table contains the estimates for Russia in Europe, by which is understood all the territory belonging to the empire between Baltic, Arctic, Black, and Caspian Seas, separated from Asia by the crests of the Urals and the Caucasus. The reader who looks up Russia in the *Statesman's Yearbook* should be warned that separate values are there given for "European Russia," Poland and Ciscaucasia, and also,

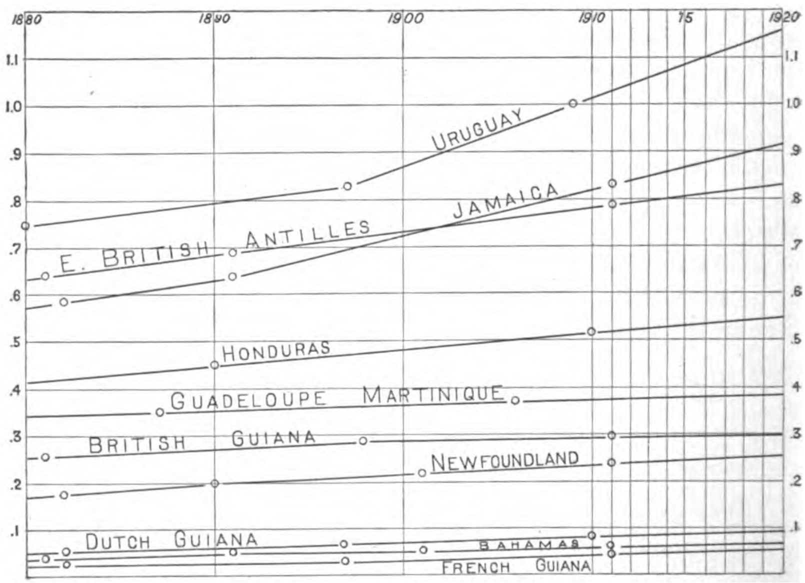

FIG. 5—Diagram showing the growth of population, from 1880 to 1920, of Uruguay, the East British Antilles, Jamaica, Honduras, Guadeloupe-Martinique, British Guiana, Newfoundland, Dutch Guiana, the Bahamas and French Guiana. The symbols are the same as in Fig. 2, except that the horizontal lines represent tenths of a million people.

but after the Russian Empire, for Finland, and all four must be added to get our Russia in Europe. The separation of the empire into two parts is of course arbitrary. The empire is one and undivided. Estimates for the whole are, in 1914, 175 millions, in 1915, 178, in 1916, 180, in 1917, 183, in 1918, 186, in 1919, 188, and in 1920, 191 millions.

It appears from the table that Russia in Europe, Austria-Hungary and the German Empire contain half the people of Europe, and

[1] The New Boundaries of the Balkan States and Their Significance, *Bull. Amer. Geogr. Soc.*, Vol. 45, 1913, pp. 819–830.

that the Russian Empire has about as many inhabitants as North and South America with the West Indies.

TABLE III. ESTIMATED POPULATION OF AUSTRALASIA IN MILLIONS FROM 1914 TO 1920[2]

	1914	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*
Australia	4.4	4.5	4.6	4.6	4.7	4.8	4.8
Tasmania	.2	.2	.2	.2	.2	.2	.2
New Zealand	1.1	1.1	1.1	1.1	1.2	1.2	1.2
*New Guinea	1.1	1.1	1.1	1.1	1.2	1.2	1.2
Melanesia	.7	.7	.7	.7	.7	.7	.7
Micronesia	.1	.1	.1	.1	.1	.1	.1
Polynesia	.3	.3	.3	.3	.3	.3	.3
AUSTRALASIA	8−	8	8+	8+	8½	8½	8½

* Starred value is less reliable.

Melanesia is Supan's term and in Stieler's Atlas is found to include the islands from New Guinea to Fiji and Tonga. Micronesia includes the Caroline and Mariana Islands, the Marshall, Gilbert, and Ellice Islands, etc., while Polynesia includes Hawaii, and Palmyra and Christmas Islands.

The whole of Australasia has about the same population as the Argentine Republic or Canada. The data here are mostly good except for New Guinea, which is barbarous and unexplored. Usually such regions have fewer people than are at first supposed.

TABLE IV. ESTIMATED POPULATION OF ASIA IN MILLIONS FROM 1914 TO 1920

	1914	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*
*Turkey in Asia	21.8	22.1	22.4	22.6	22.9	23.2	23.5
Cyprus	.3	.3	.3	.3	.3	.3	.3
*Free Arabia	1.1	1.1	1.1	1.1	1.1	1.1	1.1
British Arabia	.3	.3	.3	.3	.3	.3	.3
*Persia	9.6	9.7	9.7	9.8	9.8	9.8	9.9
*Afghanistan	6.2	6.4	6.5	6.6	6.7	6.8	6.9
Russia in Asia	32.2	32.7	33.2	33.8	34.4	34.9	35.5
*Khiva and Bokhara	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Japan	53.4	54.0	54.6	55.2	55.8	56.4	57.0
Korea	14.0	14.3	14.6	14.8	15.1	15.4	15.7
*China	313.6	314.1	314.6	315.2	315.6	316.2	316.7
Foreign China	1.6	1.6	1.7	1.7	1.7	1.8	1.8
*French Indo-China	17.1	17.2	17.4	17.4	17.6	17.7	17.8
*Siam	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Straits Settlements	1.8	1.8	1.8	1.9	1.9	1.9	1.9
*Himalayan States	4.0	4.1	4.2	4.2	4.3	4.3	4.4
British India	321.2	323.2	325.3	327.3	329.3	331.3	333.4
Portuguese and French India	.8	.8	.8	.8	.8	.8	.8
British Indian islands	3.7	3.7	3.7	3.7	3.7	3.7	3.7
Sundas and Moluccas	39.0	39.2	39.4	39.6	39.8	40.0	40.2
Philippines	8.6	8.7	8.8	8.9	9.0	9.1	9.2
ASIA	857½	862½	867½	872½	877	882	887

* Starred values are less reliable.

[2] Mr. Chas. Stratton, assistant in the Geography Department of the State Normal College at Ypsilanti, did the most laborious part of gathering data for Australasia, Asia and Africa.

There is a large margin of doubt as to the number of people in this continent. China, which surely contains a third or more of the total, offers only rude estimations. Minister Rockhill's studies long since made it clear that there were less than 400 millions, and the "family" census of 1910 suggests somewhat more than 310 millions. The figure has been taken at 312 in 1911 and an increase assumed distinctly slower than in British India, a country of similar size, but with good government and protection from some of the many agencies of destruction now operative in China. Other regions of little knowledge are starred on the table. In none of these have censuses been taken.

TABLE V. ESTIMATED POPULATION OF AFRICA IN MILLIONS FROM 1914 TO 1920

	1914	*1915*	*1916*	*1917*	*1918*	*1919*	*1920*
*Tripoli	1.0	1.0	1.0	1.0	1.0	1.0	1 0
Egypt	11.8	11.9	12.0	12 2	12.3	12.4	12.5
Egyptian Sudan	3.1	3.2	3.2	3.3	3.4	3.4	3.5
*Eritrea	.5	.5	.6	.6	.6	.6	.6
*Abyssinia	8.0	8 0	8.0	8.0	8.0	8.0	8.0
British Somaliland	.3	.3	.4	.4	.4	.4	.4
French Somaliland	.2	.2	.2	.2	.2	.2	.2
Italian Somaliland	.4	.4	.4	.4	.4	.4	.4
British East Africa	4.3	4.4	4.4	4.5	4.6	4.6	4.7
Uganda	3.2	3 3	3.4	3.5	3.6	3.8	3.9
*Tunis	2.0	2.0	2.1	2.1	2.1	2.2	2.2
Algeria	5 4	5.4	5.5	5.5	5 5	5.6	5.6
*Morocco	3.0	3.0	3.0	3.0	8.0	8.0	8.0
Madeira, C. Verde and Azores	.6	.6	.6	.6	.6	.6	.6
Canaries	.4	.5	.5	.5	.5	.5	.5
*Sahara	.8	.8	.8	.8	.8	.8	.8
*French West Africa	17.9	18.2	18.6	18.9	19.3	19.6	20.0
*Gambia	.2	.2	.2	.2	.2	.2	.2
*Portuguese Guinea	.8	.8	.8	.8	.8	.8	.8
*Sierra Leone	1.5	1.5	1.5	1.5	1.6	1 6	1.6
*Liberia	2 0	2.0	2 0	2.0	2.0	2.0	2.0
*Gold Coast	1 4	1.4	1.4	1.4	1.4	1.4	1 4
Togo	1.0	1.0	1.0	1.0	1.1	1.1	1:1
*Nigeria	25.3	25.4	25 5	25.6	25 7	25.8	26.0
Kamerun	3.0	3.2	3.3	3.4	3.5	3.6	3.7
*French Congo	9.3	9.4	9.6	9.7	9.8	9.9	10.0
*Spanish Guinea	.2	.2	.2	.2	.2	.2	.2
*Congo State	15 0	15.0	15.0	15.0	15.0	15.0	15 0
German East Africa	10.8	11 1	11.4	11.6	11.9	12.1	12.4
Zanzibar	.2	.2	.2	.2	.2	.2	.2
*Mozambique	3.3	3.4	3.4	3.5	3.6	3.7	3.7
*Angola	4.2	4.2	4.3	4.3	4.3	4.3	4.4
*German Southwest Africa	.1	.1	.1	.1	.1	.1	.1
British South Africa	9.9	10.1	10.3	10.5	10.6	10.8	11.0
*Madagascar, etc	3.4	3.5	3.5	3.6	3.6	3.6	3.7
British islands near Madagascar	.4	.4	.4	.4	.4	.4	.4
AFRICA	155	157	159	160½	162	164	166

* Starred values are very doubtful.

The estimates for three quarters of Africa are very doubtful ones. It is easy to note, however, the steady additions to fairly good data, commonly reducing the numbers formerly assigned. For Morocco recent examination of the most populous parts has brought the estimate down to a third of that formerly made.

The total for Africa, like that for Asia, is probably too large, while those for Europe, Asia and Australia are too small. By continents there result in 1914 the following:

North America...	136+	(with islands)
South America...	46+	
Europe	467+	
Asia	857—	
Africa	155—	
Australasia	8+	
The World.....	1,669 millions	

A GEOGRAPHICAL STUDY OF NOVA SCOTIA*

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Two hundred years ago Nova Scotia was nearly if not quite as promising a colony as Massachusetts. Its position was more strategic. Its climate was as good and its resources were superior. Massachusetts has no equal area of farm land as fertile as the Annapolis Valley. It has a longer coast line, fringed with harbors. Louisbourg, the French stronghold on Cape Breton Island, was scarcely second in importance to Quebec. Halifax was founded and fortified by England in 1749 as a counterpoise to the French Louisbourg, and the taking of this fortress by the New England troops was one of the great events of colonial history. Port Royal on the Bay of Fundy was the first permanent settlement in North America north of Florida. The importance attached to Port Royal is shown by the fact that it was five times taken by the English, unsuccessfully attacked by them three times, and by the French and Indians twice. It was sacked and abandoned twice, once by pirates and once by United States Revolutionary troops. The ruins of its fortifications cover 28 acres. After the Revolutionary War, more than 25,000 people—the United Empire Loyalists—left the states and selected Nova Scotia and New Brunswick for their home. Even in 1800 most people saw as prosperous a future for New Scotland as for New England. Writing in 1787, Hollingsworth says in his book on Nova Scotia:

"This country [Nova Scotia], as has been already observed, may be justly esteemed the first in the American world, with respect to

* Read at the Tenth Annual Meeting of the Association of American Geographers at Princeton, January 1 and 2, 1914.

that situation, whether in peace or war, which a great maritime power, possessed also of settlements in the West Indies, would wish to retain and improve."

Yet to-day the total population of Nova Scotia is less than that of Boston, and its average density is equal to that of Oklahoma. There are ten cities in Massachusetts any one of which manufactures more than Nova Scotia, and the semi-annual *profits* of the United States Steel Corporation in time of active business would pay for the total yearly manufactures of Nova Scotia.

Nova Scotia lies nearer Europe than does New England; it was settled by the best of European stocks, English, Scotch and Germans, and some Irish, with a large admixture of New Englanders. It has ample supplies of coal and limestone at the water's edge, while only a day's run to the north are the iron mines of Wabana, Newfoundland, also at the water's edge. Moreover, the province lies at the entrance to the River and Gulf of St. Lawrence, the gateway into Canada.

If a rigorous climate, thin soil, Atlantic waterfront, many harbors and North European stock account for the phenomenal development of New England, why have these same factors not led to similar results in Nova Scotia? And still more, since the latter has coal and the former has none?

General Geographical Conditions in Nova Scotia

The province has 21,000 square miles, more than half of which is forest well culled and much injured by fires. Three-eighths of the land is in farms, but half of this is wooded. Not over 20 per cent. of the total area is suitable for farming. The peninsula is peneplained to a relief of about 400 feet in the south, rising to nearly 1,000 feet in Cape Breton; it is underlain in part by ancient slates and quartzites, intruded by massive batholiths of granite and is also underlain by Paleozoic rocks. The entire surface was thoroughly scraped by glaciers and the southeastern shore is deeply fiorded. The coal measures are in Cape Breton Island and along the shore of Northumberland Strait. Parallel to the Bay of Fundy runs the high trap ridge known as North Mountain, of the same origin and age as the trap ridges of New Jersey and the Palisades of the Hudson. Opposite this and eight miles away extends the granite wall of South Mountain, and between lies the paradise of Nova Scotia, the Cornwallis-Annapolis Valley, eroded in the soft red shales of the Triassic. This is the principal valley of the province, the home of prosperous and well-housed farmers and apple growers. The granite and quartzite knobs are bare, the soil

on the slopes is thin, and most of the crops are grown near the roads on the so-called interval, or valley, land, or on the rich tide-marsh reclaimed from the sea by the dikes which the Acadians built or taught others to build. These reclaimed lands are made of sea mud washed into the estuaries by the powerful tides. They are the most valuable meadow lands of the province, producing as high as three tons of hay to the acre year after year. The general aspect of much of the country, with its wide stretches of cut-over and burned-over land, is not prepossessing. The farm houses are small and crops are light. The average farm of the province is valued at about $2,000 and it produces from $300 to $500. The Cornwallis-Annapolis Valley, eighty miles long and eight wide, is almost a continuous orchard. Protected on the north and south by mountain walls of considerable height and possessed of rich red soil, it is ideally suited to apple growing, and annually exports $2,000,000 worth of fruit. A single tree is officially reported to have borne 35 barrels in one year.

Next after the valley, the area of Paleozoic rocks in the north, bordering on Northumberland Strait, is agriculturally best developed. The part of the province that faces the Atlantic is the poorest and half of this is a wilderness traversed by no railroad. Even Halifax County is so little developed that it is one of the chief moose-hunting grounds of the province. Despite the continuous fringe of harbors, there is but one important port, Halifax. The port of Lunenburg in the German settlement is the chief fishing center.

The Fisheries. The nearness of the fishing banks, the many-harbored coast and the scanty soil had the same influence in Nova Scotia as in New England. In both regions these influences bred a race of boat-builders, fishermen and sailors. In the days of wooden ships, the coast of Nova Scotia, like the coast of Maine, was busy with the building of sailing vessels, and, like those of Maine, many of the shipyards of Nova Scotia are now idle. But the influence of the fisheries has left its impress upon almost every phase of the life of the province, and fishing is now and will continue to be one of the principal industries. In registered tonnage per capita, Nova Scotia vies with Norway.

The Mines. One of the few places in the world where coal is mined at the sea shore, in fact two miles out under the sea, is in Nova Scotia. The Sydney coal field in Cape Breton occupies 200 square miles and is bounded on three sides by salt water. In Pictou County are seams 24 to 30 feet thick. Nova Scotia pro-

duces two-thirds of the coal mined in the Dominion. The coal from the Sydney mines in Cape Breton is taken to Quebec and Montreal on specially constructed steamers at a small cost per ton. Off the eastern coast of Newfoundland is the strange little island of iron ore whose beds dip under the sea, so that the major part of the ore properties are submarine. How much coal and iron have been put beyond men's reach by the sinking of the land at the mouth of the St. Lawrence no one can tell. At the Sydneys and at New Glasgow are the largest smelting and steel plants of the Dominion. Here on the shore of the Gulf of St. Lawrence the iron ore and coal meet under many favorable conditions of location. It looks as if iron and steel production and the subsidiary industries which live on the steel mills have a future here. Already a little Pittsburg has grown up. If it does not grow into a big Pittsburg it will be the fault of men, not of geography.

All told the extractive industries yield \$25,000,000 a year, the value of two dreadnoughts. The value of all manufacturing is \$40,000,000 to \$50,000,000 a year, with iron and steel the leading item.

Railroads. The railroads of Nova Scotia are probably as numerous and as good as conditions will warrant, but they do not remind you of the Pennsylvania. The government-owned Intercolonial Line crosses the province and terminates at Halifax. It runs two good trains each way daily, one even on Sunday. This Sunday train is a special concession to an unwelcome demand from outside and is not popular in the province. Sunday trains or boats in the Maritime Provinces are not countenanced. However, changes of great moment are under way. The Canadian Pacific has obtained the Dominion Atlantic Line which connects Digby on the Bay of Fundy with Halifax on the Atlantic. This may mean that Halifax is to become the principal Atlantic port of the great Canadian Pacific system. It is understood also that this will be the Atlantic terminal of the Grand Trunk Pacific when it is completed. Vast terminal improvements involving \$35,000,000 are now in progress at Halifax, and the people of the old town are slowly getting into a new frame of mind. They see a future for their city.

So much for the material side of the neglected province of Nova Scotia—the province that has been passed by. In its material aspects there is nothing that rises above the ordinary, but there is a side to its history which looms above the commonplace and to this I now ask your attention.

The People. It is not necessary that, when wealth increases,

men decay. It is not a demonstrated law that bare hills, or poor land or a rigorous climate are the necessary environment wherein to breed *men,* but it is a law that a land of great material prosperity, teeming with industry and wealth, attracts its young Alexanders and Shakespeares into the world of business, and they become Harrimans, Morgans, and Rockefellers. Not so with a land placed and endowed like Nova Scotia. Into this province there was a migration of some of the same stock that made New England, and into it there came thousands of Scotch, mostly highlanders. From such scions as these, men are bound to grow, and if the material activities of their country can not absorb their energies, then those energies are turned into other channels. Nova Scotia is, as its name warrants, a Scotchman's province. In Halifax I met the chief engineer in charge of the great harbor and terminal improvements; his name is MacGregor. I met the President of Dalhousie, the leading collegiate institution; his name is Mackenzie. He gave me the opportunity of meeting his right-hand men on the board of trustees; their names are Campbell, McInnes and Mitchell. The provincial premier is George Murray and the Lieutenant Governor is J. Drummond MacGregor.

Nova Scotia has long been the unchallenged leader in Canada in the production of statesmen and scholars. It has furnished three of the premiers of the Dominion, the present incumbent being a Nova Scotian. It has furnished a major part of the college presidents for the rest of Canada. Pictou County is the center of the Scotch population, and this single county has supplied a list of college professors and college presidents that would do credit to a province. From this one county, nine men are now serving or recently have served as college presidents, and as prominent college professors, 18 others, not to mention educators of lesser standing. I met a man whose position and income is that of a railroad ticket agent in a city of 8,000 people. He seemed to regard it as not worthy of comment that all of his four sons have gone through college or are going through. Undoubtedly the richest product of this little province is *men,* men whom it has educated and sent out to the rest of Canada and to the United States.

In striking contrast to Pictou County with its Scotch population, devoted to higher education and producing in a generation or two 27 college presidents and professors, is Lunenburg County on the Atlantic coast, settled in 1752, mainly by German farmers from the Palatinate and Hanover. Of its 30,000 population, in 1891, 9,000 could neither read nor write. They are an in-

dustrious, thrifty and fairly prosperous people, but they are not making their sons into premiers or college presidents. The influence of the sea and of the fishing banks has made over a race of peasant farmers into the preeminent fishing population of Nova Scotia. And a people whose interests—created by their environment—seek occupation in fishing do not stress the intellectual side of life. It is a question which I ask and cannot answer: Suppose the same Scotch colonists who settled in Pictou County had, instead, settled in Lunenburg County, would they in that environment have produced the long line of illustrious men that they have produced in their present environment? It is the old question of racial stock *versus* environment in the making of men.

Nova Scotians are emphatically a religious people. Only 500 people out of the 500,000 are without church affiliation. The seating capacity of the churches practically equals the population. I was told of a recently enacted law in Halifax that limits the number of saloons to one for each thousand of the population. In Nova Scotia, Sunday is Sunday and business stops, trains stop and people go to church.

Isolation as a Consequence of Geographical Conditions

And now in conclusion: Why has Nova Scotia won the name of "the province that has been passed by?" Why is there such a contrast between the development and present life of New Scotland and of New England, so similarly placed and so similarly peopled? If the hard conditions of farming, the abundant waterpower, the momentum of an early start and the intelligence of the people of New England satisfy our quest for the reason of New England's industrial development, why do we not get a similar result in a province just across a political boundary? To me two reasons are clear. One is a matter of political geography and the other a matter of physical geography. The throbbing, buoyant, optimistic, aggressive life of the Republic is partly the fruit of our patriotism and of our faith in our country and partly the result of our exceptional opportunities. Our democratic institutions and our wealth of opportunity have drawn to us a steady stream of new blood always regarded as a menace when it was coming and as a blessing when a new current had set in. No such stream of optimism has until recently fed the life of Canada in general and not even yet, the Maritime Provinces. These provinces have never shared adequately in the economic development of the Dominion as a whole, and this appears to be, in large part at least, a result of their physical geography, mainly location. When the land at

the mouth of the St. Lawrence sank and admitted the sea a thousand miles up the valley, it fixed the commercial meeting place of land and ocean at the foot of the Lachine Rapids, at the island of Montreal. Between the coast of Nova Scotia and the attractive lands of Ontario and Quebec lies a long stretch of unattractive country. Nova Scotia is isolated, damagingly isolated from the real centers of Canadian activity, and politically cut off from its natural neighbor, New England. The great transcontinental railway lines did not find it necessary or expedient to terminate on the shore of Nova Scotia. Until the present, the ports of Montreal and Quebec, in summer, St. John and Portland, in winter, have been used, and Nova Scotia has been passed by. It has had no hinterland, and in this lies one of its greatest contrasts to Massachusetts. Despite its nearness to Europe, most of the Atlantic liners steam to the north up the St. Lawrence, or southward to ports which were more accessible from the interior, and these have received and dispatched the transatlantic trade of Canada. I have encountered no instance of a region seemingly so favorably situated for ocean commerce and which has proved up to the present to be so unfavorably placed.

Nova Scotia, the outpost of Canada on the Atlantic, the colony which was thought to have the best commercial situation in the American world, illustrates, when taken in connection with the St. Lawrence, the fact that it is not usually the point where the land juts farthest into the sea, but the point where the sea pierces farthest into the land, that offers the most advantageous place for the meeting of land and water routes. Canada has developed slowly, and Nova Scotia has been compelled to wait and seems to have been content to wait until the time when the growing industries and ocean trade of the Dominion should make the splendid harbor of Halifax a necessary winter terminal of its great continental railroads. This is now coming to pass. A new spirit of optimism is taking root in the province. The vigorous industrial life of Amherst, New Glasgow, Truro and the Sydneys is an object lesson in the possibilities which Scotia's coal and Newfoundland's iron, meeting under exceptionally favorable geographical conditions, can do for manufacturing and consequently for the whole economic life of the province. There is no boom on in New Scotland. They are not an effervescent people. Halifax is not Seattle. Yet they believe, and the visitor to their province comes to believe, that Nova Scotia is rounding a corner, and that geographical conditions, which, under a past regime, have retarded her growth, are now likely gradually to reverse their influence.

THE EFFECT OF SEVEN YEARS' EROSION ON THE CALIFORNIA FAULT LINE OF 1906

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The persistence for more than seven years of the minor surface features due to horizontal movement in 1906 along the San Andreas Fault has led to expressions of surprise even from some widely known students of earth forms. The movement in the part of the fault zone[1] to be discussed was practically horizontal and was in a region where no bare rock outcrops. At the time of the last faulting the land was largely a pasture interspersed with occasional small patches of low brush. The surface features due to the differential horizontal movement on the two sides of the fault plane are made largely by the fracturing and crumpling of the sod, frequently resulting in a low ridge such as that shown in Figure 2. The elevation of the ridge is slight, usually varying from a few inches to one or two feet above the general level. The width of this ridge is from three to ten feet. It was naturally expected that erosion would cause a rapid lowering of the little hummocks of the fault trace because of their small size, steep slopes, and exposure of unprotected soil in the breaks. Notwithstanding the softness of the material, observation now shows that at the present time, January, 1914, after seven years of rainfall, the fault trace in unplowed land may be followed as certainly and with nearly as little effort as it was followed in April, 1906. Recent plowing of the area shown in Figure 2 necessitates that comparison be made with the present aspect of the fault trace as it appears on the nearest slope with similar conditions. Figure 3, however, represents no exceptional instance of the present appearance of the fault trace, as it is one of six photographs taken during an hour's walk, all of which show the low ridge with equal clearness, the choice of Figure 3 being based on the closest approximation of the slopes to those in Figure 2. It will be seen that the main effect of the seven years' erosion has been merely the softening and rounding of the sharp edges of the broken sod. The fact that different localities are

[1] The San Andreas Fault emerges from the sea about ten miles south of the Golden Gate at Mussel Rock, a point designated on the San Mateo sheet, U. S. topographic map, and shown on Figure 1. The trace of the fault for the next four or five miles southeasterly along the hill tops is the portion directly considered in this paper.

represented in the figures precludes any estimation of the amount of reduction of the general elevation of the ridge as a whole.

Any surprise at this persistence of the minor surface features is not to be taken as an indication that the facts here described controvert opinions formed from proper consideration of the problem, for it may be merely the unconscious effect of the modern scientific view that all topographic forms are ephemeral phases in the geographic cycle. The problem has received but little attention

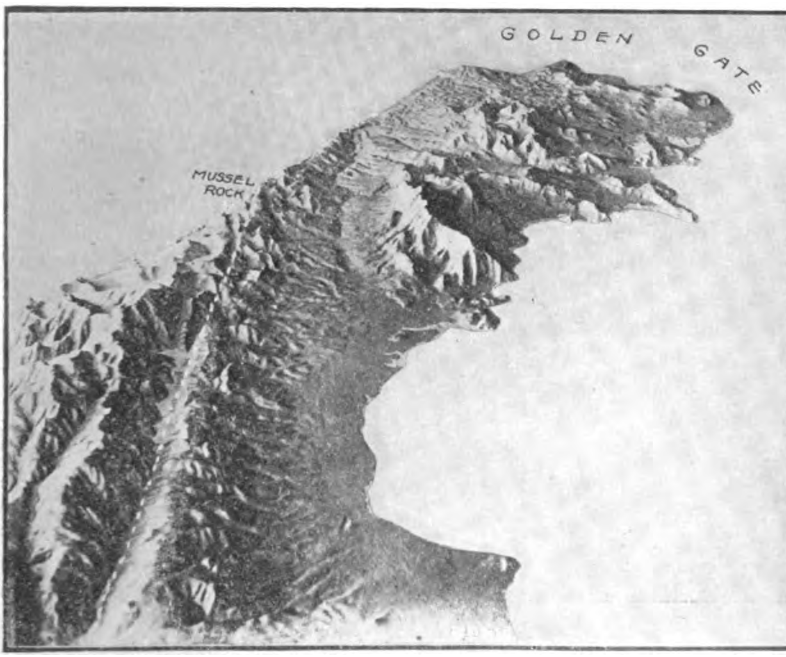

FIG. 1—Perspective View of a Model of San Francisco Peninsula. The coast line on which Mussel Rock lies runs almost due north and south; the Golden Gate trends east and west. The trace of the 1906 fault is shown by the line dotted in white. Original model by Professor A. C. Lawson.

hitherto, but the approximate determination in years of the period for the complete obliteration of the fault trace—both irregularities and ridge—is becoming a question of considerable interest and even of practical importance in the study of a region where faulting is frequently manifest at the surface. The only reference to the problem thus far noted is by Dr. G. K. Gilbert in his description of a portion of the San Andreas fault zone lying to the north-west of San Francisco.

"The fault-trace, however, is a relatively perishable and transient phenomenon and its preservation might have comparatively definite meanings. At two localities I thought I discovered old 'traces' of the ridge type....The features are....too indefinite to be recognized in the [photographic] view. If these old traces have been properly identified they are of very moderate antiquity. I should suppose that the ridges of the recent trace would lapse to such a condition in four or five years and that they might persist, under pasture conditions, for two or three decades."[2]

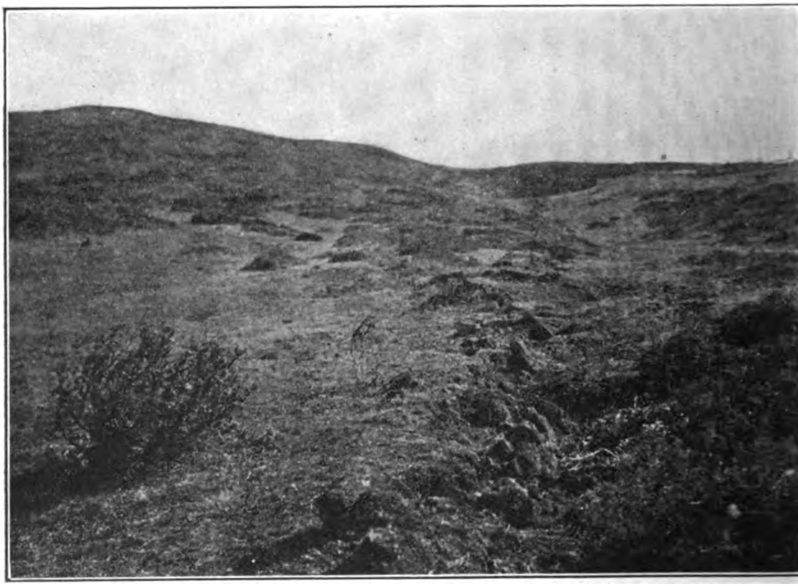

Fig. 2—Trace of the San Andreas Fault as it appeared in 1906.

The condition of the fault trace at the present time indicates that the estimated period of four or five years is entirely too short, for "traces" of the ridge type to become so obscure as not to be recognized with certainty, for they are plainly evident in photographs taken after the expiration of seven years. The writer judges that there is strong probability that they will continue to be unmistakable for quite a number of years to come. The particular section of the rift under consideration has been traversed by the writer once or twice every year since 1906. The greatest change, the softening of the sharp edges of the broken sod, occurred, very

[2] The California Earthquake of April 18, 1906, Vol. I, p. 73. Carnegie Institution, 1908.

naturally, during the first two winters. From the physiographic standpoint it is unfortunate that the growth of San Francisco has caused the vegetable gardens to be pushed constantly southward and that much of the pasture land through which the rift passed is being brought under cultivation. The probability grows stronger that man will erase all features in this portion of the fault zone long before erosion would have obliterated them.

More distant sections of the rift to the northwest may be less

Fig. 3—Trace of the San Andreas Fault as it appeared in November, 1913. This locality is a little over a mile southeast of that in Figure 2, which has been plowed during the past year.

disturbed. It is hoped that somewhere along the fault zone at intervals of a few years careful observations may be made, supplemented by photographs which will show the successive stages in the process of final obliteration of the fault trace.

About eighteen miles distant from and approximately parallel to the San Andreas Fault is another known as the Haywards Fault. Movement along this line in 1868 resulted in a crack manifest at the surface for some twenty miles. The retracing of this line by observers having in mind the criteria furnished in April,

1906, has not resulted in any report of the present existence of remains of a fault trace similar to that shown in Figure 2. However, the two fault movements are probably not comparable. The incomplete records of the 1868 movement on the Haywards Fault indicate that the horizontal movement, if it occurred, did not exceed three feet, while the movement in the San Andreas Fault in 1906 reached a maximum of twenty-one feet. It should also be remembered that along the 1906 rift the size and definiteness of the fault trace varied greatly in short distances and with the slope of the land. Consequently the failure to find signs of the fault trace of 1868 still existing does not conclusively prove that such traces of the 1906 fault may not persist for forty years or even double that period under favorable conditions.

As the rapidity of erosion is directly related to the amount and to the distribution of rainfall the data given below should be considered, especially if comparison is to be made with the duration of similar features elsewhere. The mean seasonal rainfall in San Francisco is 23.07 inches, but about 82 per cent. of this falls in the five months of November to March inclusive. The maximum rainfall in any one month since 1906 was 13.79 inches, occurring in January, 1911. The accompanying table will afford detailed information as to the monthly distribution of rainfall during the last seven years.

RAINFALL AT SAN FRANCISCO FROM JULY, 1906, TO JUNE, 1913
From U. S. Weather Bureau Records

SEASON	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MCH.	APR.	MAY	JUNE	SEASONAL
1906-7......	0 08	0.11	0.18	0 03	1.59	6.90	4.41	3.02	8.42	0.11	0.04	1.28	26.17
1907-8......	T	0 02	0.11	1.36	0.04	3.66	4 88	5.39	0 90	0.22	0.76	0.01	17.35
1908-9......	0.02	0.01	0.13	0.61	1.34	2.15	10.51	7.53	3.27	T	T	T	25 57
1909-10.....	O	T	0 80	1.23	2.43	5.59	3.24	2.09	3.78	0.31	0.03	0.02	19.52
1910-11.....	T	O	0.05	0.65	0.48	1.73	13.79	3.02	4.57	0.89	0 28	0.03	25 49
1911-12.....	T	O	T	0 28	0.60	2.54	2.47	0.41	4.10	1.38	1.47	0.81	14.06
1912-13.....	T	O	1.25	0.49	1.94	1.30	3.84	0.43	1.47	0.60	0.63	0.02	11.97
Means....	0.02	0.02	0.31	1.00	2.54	4.51	4.88	3.56	3.74	1.66	0.73	0.16	23.07

Means are for a period of 63 years, from 1849-50 to 1912-13.

The data indicating the rainfall for San Francisco undoubtedly apply, so far as the monthly distribution is concerned, to the hills where the fault trace occurs, but the amounts should be materially increased. The hills are from three hundred to four hundred feet higher than San Francisco and are also nearer to the northern ridges of the Santa Cruz Mountains. According to the

rainfall map, based on long period records and published by the Spring Valley Water Company,[3] the isohyetal line of forty inches passes through the fault zone area. This would indicate not only a seasonal rainfall of forty inches instead of twenty-three inches but also that the heaviest rainfall in a single month may have reached twenty-five inches. Remembering that in this climate four-fifths of the rainfall is concentrated in five winter months, the persistence of the fault trace is certainly not to be attributed to the aridity of the climate.

Agents of erosion other than water have relatively little effect in this locality. Actual freezing of the ground occurs so seldom and for such short periods of time that it must have but slight influence on the rapidity of erosion. The effect of wind erosion may also be omitted from consideration with grass-covered land receiving the amount of rainfall indicated above and also subject to the ocean fogs during much of the summer.

The original object of the writer in keeping a part of the fault zone under observation during the last seven years was not for the purpose of determining the persistence of the fault trace. Instead, the observation was undertaken with the idea that erosion might have played quite a part in the development of the small depressions or sags characteristic of the fault zone as it was prior to the movement of 1906. Writers on the San Andreas Fault have quite generally attributed these small depressions to the dropping of minor fault-blocks or wedges along the fault zone, thus classifying them genetically with larger valleys of the *graben* type.

There is certainly a possibility that in the horizontal movement of the two sides of the fault plane, concave surfaces would in some instances be left opposite each other, leaving a vacant space of some appreciable size at a relatively short distance below the surface. Under such conditions there should be a slow downwashing of fragmental material and of soil which would leave a sink-hole at the surface. The observations thus far have not been conclusive. In two or three places slight sinking took place, but these localities have since been plowed, which may possibly interfere with further development. Surface wash in cultivated land will probably fill in a developing sink as rapidly as the depression would grow by underground settling, unless in the extreme instances of the formation of an open channel connecting the bottom of the depression with the cavity below.

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3 Future Water Supply of San Francisco. San Francisco, 1912.

The slowness of surface erosion as indicated by these observations suggests that the theory of the development of "fault-sags" by erosion subsequent to the faulting may yet be found correct in some instances. Sufficient underground water may seldom be present to facilitate such action. The heaviest rainfall for a single month recorded at San Francisco is 24.36 inches. As this indicates a possibility of forty inches in a single month with the heavier rainfall of the fault zone, the greatest rapidity of erosion and the best opportunity for the development of an erosional fault-sag may not have occurred as yet. Any conclusion as to the erosional origin of fault-sags along the rift will have to be deferred until the observations have been carried on for a much longer period and until several years of excessive rainfall have occurred.

ABSTRACTS OF PAPERS READ AT THE JOINT MEETING OF THE A. G. S. AND THE A. A. G. IN NEW YORK, APRIL 3 AND 4, 1914

THE PLATFORMS OF BARRIER CORAL REEFS. By THOMAS WAYLAND VAUGHAN

There are three kinds of coral reefs, *viz.:*

1. Fringing or shore reefs which occur along the strand line.
2. Barrier reefs which occur at variable distances off shore and have lagoons from one or two to as much as thirty or even forty fathoms in depth between them and the strand line.
3. Atolls, which are ring-like and inclose lagoons above whose surface no land masses of importance protrude.

As the relations of barrier reefs and atolls to the platforms on which they stand constitute, in the opinion of geologists, the essential part of the theory of the development of Recent reefs, the warfare of coral reef theory has been waged over the interpretation of these relations, which are the conditions of changing or changed position of the strand line and the part played by reef-forming organisms as constructional agents. The special object of the paper was to point out the relations of barrier coral reefs to the last dominant change in the position of the strand line and to indicate the part the organisms forming Recent barrier reefs have played in building the reef platforms.

The introductory remarks were followed by a résumé of the principal hypotheses and theories advanced in explanation of barrier reefs and atolls. Those of Darwin, Dana, Semper, Murray, Admiral Sir W. J. L. Wharton, Alexander Agassiz, C. E. Andrews, Stanley Gardiner, Hedley and Griffith Taylor, Daly, and Wood-Jones were briefly reviewed. It was pointed out that, according to Darwin and Dana, barrier reefs and atolls margin platforms built during subsidence by agencies dependent upon the presence of reefs, while the other hypotheses advance different explanations.

The criteria for determining the direction and amount of change in position of strand line, whether by positive or negative movement, were briefly enumerated. With regard to criteria for estimating the constructional work of reef-forming organisms is was said that if corals and the associated organisms, which form the material composing what are designated coral reefs, have built the platform, the geographic limits of the reef platform and the reef-forming organisms should be coincident; and that, if the platform owes its origin to agencies other than those of reef-forming organisms—the reefs being merely superimposed upon it—its extent should be beyond the limits of such organisms and independent of their presence.

The recent literature in which physiographic criteria have been applied to the eludication of the coral reef problem was briefly reviewed. Attention was especially directed to the work of Alexander Agassiz, Verrill, and others in the Bermudas; Alexander Agassiz and others in the Bahamas; Hayes, Vaughan, and Spencer in Cuba; Branner in Brazil; Sanford, Matson, and Vaughan in Florida; C. E. Andrews, Hedley and Griffith Taylor, and T. W. Edgeworth David in Australia; Wood-Jones in the Cocos-Keeling group; P. Marshall in the Society and Cook islands; and C. Elschner in Nauru and the Paumotus. The enumeration showed that both American and Australasian geologists, each group working in the region in which it was located, have been persistently applying physiographic criteria to the study of the coral reef problem for the past thirteen or fourteen years.

The results of the author's recent expedition to several smaller West Indian islands, largely for the purpose of studying the changes in strand line antecedent to the development of the living barrier reefs, were presented. It was shown that the shore line of Antigua is deeply indented by numerous bays and harbors, as St. Johns, Five Islands, and Falmouth harbors, and Willoughby, Nonsuch, and Belfast bays. The absence of terraces and elevated wave-cut cliffs was mentioned, and it was stated that in St. Johns Harbor at a depth of about twenty feet below sea level a four-foot bed of peat, which according to Mr. C. A. Davis is not composed of marine plants, adds confirmation to the inference that the last important movement of sea level was positive. Stable conditions for some time is shown by the alluvial fillings at the heads of re-entrants and along streamways, and by high wave-cut cliffs. The island of Barbuda, which occupies the northern part of the shallow plateau on the southern part of which is Antigua, is separated from the latter island by water eighteen fathoms or less in depth. In Barbuda fresh-water springs which emerge below sea level have been observed by Mr. H. A. Tempany, and the similarity of the land mollusca of Antigua and Barbuda supports the inference that these islands were part of one land mass in Pleistocene time and have been severed by positive movement of sea level. Barrier reefs occur as disconnected banks on the platform near both Antigua and Barbuda. It is evident that this platform has been submerged and that its existence is independent of the reefs which grow upon it in certain favorable localities.

The islands St. Bartholomew, St. Martin and Anguilla, which rise above the surface of the St. Martin Plateau, are separated by water ranging from fourteen to sixteen fathoms in depth, while there is an increase in declivity near the edge of the platform at depths between thirty and forty fathoms. That the last important change of sea level was by positive movement is evident from the indented character of the shore line in St. Bartholomew, St. Martin and Anguilla; and in Anguilla additional evidence is afforded by the

underground communication between the sea and inclosed basins in the limestone. Stable condition of the shore line for a considerable period is attested by wave-cut cliffs, the development of the beaches, and the alluvial fillings at the heads of reentrants in the land mass, and, in St. Martin, by the presence of unterraced flood plains along the streamways. Barrier reefs occur in places off these three islands but are disconnected and occupy a very small proportion of the surface of the platform. It is evident that these reefs are merely superimposed on an antecedent platform brought into its present relation to sea level by submergence.

The well-developed barrier reefs off both the north and south coasts of St. Croix Island occupy portions of the surface of a platform which, as shown by the indented, ragged coastline and the depth of water on the platform, has been submerged. The platform above the surface of which the Virgin Islands rise, the nature of their coast line, and the coral reefs of the Virgin Bank, were briefly described. The maximum depth of water between the islands is about seventeen fathoms. The coastal phenomena, such as reentrants into the land mass, alluvial fillings at their heads, unterraced alluvial bottoms along streamways, and wave-cut cliffs on the unterraced promontories, were mentioned, especially for the island of St. Thomas, which was personally examined by the author. The conditions under which the coral reefs of the Virgin Bank and eastern Porto Rico have been developed are clear, that is, they also are superimposed on a depressed platform, a very small portion of the surface of which is covered by them.

These relations were shown to be similar to those already known to prevail in Florida, Andros Island, Bahamas, and Cuba, where the living barrier reefs stand upon depressed platforms which are independent of the reefs as they are continuous irrespective of the geographic limits of the reefs.

The barrier reefs of Honduras, Nicaragua, and Brazil were next briefly described and it was shown that they conform to the conditions of development enunciated for those of Florida, Cuba, the Bahamas, the Virgin Islands, and the northern Leeward Islands, that is, all are superimposed on submerged platforms.

The principal barrier reefs of the Pacific Ocean were then considered, namely, the Great Barrier Reef of Australia, the barrier reefs of New Caledonia, and those of the Tahiti and Fiji groups. In each instance it was shown that the reefs occur on submerged platforms which are independent of the presence of the reefs and the conditions are therefore similar to those indicated for the Gulf of Mexico and Caribbean region of the Atlantic.

The remarks on the platforms of barrier coral reefs were summarized in the following words: "This examination of the principal barrier coral reefs of the world leads to accordant results as regards the relations the reef platforms bear to change of sea level and the part played by corals and associated organisms as platform builders. All the platforms have been brought below sea level by a moderate submergence, less than forty-five fathoms, and the living reefs are superimposed on these platforms where the conditions necessary for their existence obtain."

The history of many reef areas antecedent to the development of the recent reefs had been exceedingly complicated, and in much of the discussion of the problem, failure to recognize the proper sequence or the relative importance of events has led to misinterpretation. The consideration of these complexities is beyond the province of the paper.

The subject of atolls was briefly considered. The results of investigations recently conducted in Florida show that of the two rival hypotheses for the formation of atolls, whether by submarine solution or by constructional agencies, the formation by the former method, as relates to Florida, must be eliminated from consideration. This conclusion coincides with the results of Hedley and Griffith Taylor obtained on the Great Barrier Reef of Australia and those of Wood-Jones from a study of the Cocos-Keeling group. The results of the author's investigations of the effects of winds and currents in shaping atoll rims confirm the opinions already published by Hedley and Taylor and by Wood-Jones. The atoll rims of both the Marquesas and the Tortugas are constructional phenomena and owe their configuration to the prevailing winds and currents. The atolls along the line of the Great Barrier Reef of Australia and those of the Florida coral reef tract rise above a comparatively shallow platform. The atolls that encircle in various degrees the edges of the flat summits of mountains rising from oceanic depths must be attributed to somewhat different causes, although the effect of winds and currents in shaping such atolls must be admitted. The greater restriction of the reef-forming organisms to the outer margin of the flat summits is mostly if not solely due to the intolerance of reef-forming organisms to sediment.

It was then stated that Admiral Sir W. J. L. Wharton had clearly pointed out the incompleteness of atoll rims by his words "the low rim of growing coral which encircles their edges in various degrees." Daly's compilation of the depths of atoll lagoons is most significant, as it shows accordance in depth with the lagoon channels within barrier reefs. Great crustal subsidence for atoll areas is not indicated by the facts at present available; the evidence, however, does indicate a Recent increase in the depth of water in barrier reef and atoll areas by an amount of twenty fathoms or somewhat more but not so great as fifty fathoms.

The author did not attempt to explain the processes whereby the platforms on which the reefs stand are formed. He merely showed that they are older than the Recent reefs, that they have been brought into their present relation to sea level by submergence, and that the reefs are superimposed on them. The problem of the formation of these platforms, although one of great geologic importance, is aside from the immediate object of the paper.

Mr. J. E. Spurr has supplied the following note bearing upon the results of Mr. Vaughan's work:

"The following observations which were made on the stream mouths along the east coast of Nicaragua are presented, as bearing on the recent discussions of the relation of coral reefs to coastal submergence:

"The writer has recently visited repeatedly the east coast of Nicaragua from Cape Gracias á Dios to Bluefields, and has had occasion to observe a large part of the valley of two of the major streams which empty along this coast: the Wonks, or Wonki, or Coco River, and the Prinzapolca River. He also visited, several times, the lower portion of a third important river, the Escondido, which empties at Bluefields. The lower portions of all these streams have unmistakably, it seems to the writer, the usual characteristics of submerged river channels indicating relatively recent uniform and slight submergence of the coast line. This accords with the explanation deduced by Vaughan as to the locus of the coral reefs which occur in a belt adjacent to this coast,—an explanation which, I understand, has been arrived at by a study of similar areas and by deduction from conditions shown in existing charts."

Other Abstracts *

Over the San Juan Mountains to the Mesa Verde. By Wallace W. Atwood. The dissection of a great volcanic plateau in the southwestern portion of Colorado has resulted in the development of a group of magnificent scenic features, the present San Juan Mountains. This work of land sculpture has continued through at least three cycles of erosion and has advanced into a fourth cycle. During that time there have been at least three epochs of mountain glaciation in the region. A record of a still earlier glacial period preceding the development of the great plateau has also been recently found at the northwest base of the range. In the plateau and mesa country bordering the mountains the record of erosion is remarkably well preserved and the surfaces of many of the mesas are mantled with débris washed from the mountains during the various cycles of erosion.

To the southwest of the range is Mesa Verde, where there is a remarkable group of ancient cliff dwellings. The life of the ancient cliff dwellers appears to have been largely controlled by the physiographic conditions which obtained in that region during the time that the dwellings were occupied.

In the Forest of Sunburst: A Study in Anthropogeography. By Collier Cobb. Seventy-six per cent. of western North Carolina is still under forest cover, or a little more than 3,000,000 acres of forest land is found in the sixteen mountain counties. The Forest of Sunburst lies in the densest portion of this forest area, occupying the slopes of Pisgah Range and the High Balsams and the valleys and coves included between them, thus covering the whole of the upper portion of the basin of Pigeon River and its tributaries. The mountains of North Carolina are the oldest forest land on the continent, and the botanists and plant geographers are agreed that the deciduous forests of eastern North America have been derived from that forest which reaches its greatest development in this mountainous region of western North Carolina.

While the hardwoods of the northern United States have migrated from the mountains since the last glacial period it seems equally certain that the coniferous growth on the Balsams and other high mountains was forced south at the time of the greatest extension of the ice sheet, and is able to survive now only in the cooler atmosphere of our high mountains.

The mean annual temperature in these mountains is 48°, and in the valleys they enclose, 54° Fahr.; while the rainfall of the region, most of which comes in the growing season, is 70 inches, being greater than that for any other portion of the United States except the Puget Sound Region.

This forest region was but sparsely inhabited a century and a half ago though a few bold men of the better class had moved from the lowlands into the mountains. None of the "poor whites" ventured across the Blue Ridge, and the term "mountain whites" applied to these highlanders, in distinction from the so-called "poor whites," is wholly misleading since the mountaineers were never of this class.

The first frontiersmen in this forest region were from those Swiss and German Palatines who began flocking into Pennsylvania late in the seventeenth

* These are shorter abstracts, supplied by the authors of papers read at the same meeting. Professor F. J. Turner's abstract of "Geographical Influences in American Political History," Mr. Oliver L. Fassig's abstract of "The Period of Safe Plant Growth in Maryland and Delaware," and Dr. L. A. Bauer's lecture on "The General Magnetic Survey of the Earth" will appear in the *Bulletin* later.

century. They settled originally "to the westward of the Quakers in the fertile limestone belts at the foot of the Blue Ridge and the Alleghanies. Here they formed the Quakers' buffer against the Indians, and, for some time, theirs were the westernmost settlements of British subjects in America. These Germans were of the Reformed or Lutheran faith. They were strongly democratic in a social sense, and detested slavery. They were model farmers and many of them were skilled workmen at trades."

These were later followed by Scotch-Irish who came from Ulster County, Ireland, when their leases from James I. had expired, and they were persecuted and evicted. Froude tells us that, "In the two years that followed the Antrim evictions, 30,000 Protestants left Ulster for a land where there was no legal robbery, and where those who sowed the seed could reap the harvest."

These people settled on the frontier of the British colonies in America, all the way from central Massachusetts to the Valley of Virginia, being in Pennsylvania just beyond the German settlements. Immediately they began fighting Indians, and gradually extended their conquests down into the piedmont and mountain regions of the South. From Lancaster, York, and Berks County, Pa., came the ancestors of the men who have counted for most in this section, from Daniel Boone and David Crockett to John C. Calhoun and William A. Graham, to Zeb Vance and Peter C. Pritchard. The mountaineers are of this same blood to-day, with not one whit of admixture from any other source; and they have preserved in these forests the manners and customs of their Teutonic and Scottish ancestors, and their speech is the good idiomatic English of the Scottish borderland, with nothing approaching a dialect. They are merely our contemporary ancestors lacking our present-day outlook; and needing not missionaries, but economic opportunity. Their speech is in no sense Elizabethan, as some have reported, for I have heard in Pennsylvania within the last thirty years, every form of expression with which I am familiar in western North Carolina, and some of them occur to-day around Worcester, Mass.

The illustrations [lantern slides] show the people at their daily tasks in the Forest of Sunburst, where I have known them since 1872 and taught them in 1881-2-3, and have been with them a month or more every summer since that time. There has always been a marked absence of blood feuds among them. No people in the world are quicker to lay hold on opportunity; and what they can do for themselves in this and the adjoining Pisgah Forest is well shown by their advancements under improving conditions. The stimulus given to the arts and crafts of the mountains by the coming of the tourist to this region is showing itself in the revival and great extension of their ancient home industries; and some of the most skilled carvers came out of these forests.

Land Sculpturing Processes in Arid Lands, with Observations from Northeastern Africa. By William Herbert Hobbs. The introduction to this paper consisted of a review of the ideas which have been held by geologists to account for the origin of the great basin-like depressions of the arid lands, and the evolution of the doctrine of deflation with emphasis upon the work of Walther, Passarge and the geologists of the Egyptian Survey. The original contribution of the paper related to the origin of the basins which lie within the great Libyan hamada to the west of the Nile Valley, the so-called "oases" of the Libyan Desert. Briefly stated, the evidence that these depressions have origin-

ated largely through the process of deflation, consists in the general evenness and horizontality of the hamada, the local nature of the disturbances in association with the depressions, the fierce duststorms and sandstorms of the region, the essential uniformity in direction of the strong winds and the trains of dunes trailing off far to leeward of the depressions, the steep northern and the graded southern descents into the basins, and, lastly, the deep loess soils (cotton soils) of the Sudan to leeward of the depressions where the equatorial rains have caught and held the migrating dust. The peculiarly simple conditions which are encountered are further explained by the fact that the hard capping of limestone in the hamada is immediately underlain by soft shaly deposits, and this has given rise to the belief that the local displacements have fixed the position of existing depressions through permitting this protective cover to be locally attacked by the drifting sands and undermined. Evidence that the effective range of action of drifting sand extends but a few feet above the surface of the ground was presented both for the region especially treated and for other arid districts.

Botanical Phenomena and the Problem of Coastal Subsidence. By Douglas W. Johnson. Students of shoreline physiography must devote much attention to such botanical phenomena as furnish evidence of recent changes in the horizontal or vertical position of the coast. The kinds of plants and plant remains in the marshes, the distribution of plants on the beaches, and the physical condition of plants at the immediate shoreline give reliable indications of recent shoreline changes. Unfortunately, this botanical evidence has been widely misinterpreted to indicate a progressive subsidence of the land. The paper supports the thesis that the botanical phenomena prove horizontal and vertical fluctuations of the shoreline which are not connected with any general land movement.

The Characteristics of the Mississippi Delta in the Light of some Observations on Old World Deltas. By E. W. Shaw. Certain phenomena, particularly irregular subsidence on land and the upheavals off shore known as mud lumps, suggest that the Mississippi delta is affected by internal flowage. In the hope of obtaining important side light on this and other problems, a brief examination has recently been made of many large and small deltas of Europe, Northern Africa, and Western Asia. The progress made in understanding the Mississippi delta was, however, through the observation of dissimilar, rather than similar characters, for each delta seems to be built on individual specifications. The Mississippi delta appears to be unique in the rapidity of its growth, in the fineness and arrangement of the materials composing it, and in other characters which seem related to these, such as the extreme development of the bird foot form, the narrowness, depth, and stability of its stream channels, and, most interesting of all, a condition of unstable equilibrium.

The stability of a delta appears to depend principally on (1) its thickness, (2) the slope of its front, (3) the proportion of sand in the river's sediment, (4) the extent to which this sediment is washed by the sea or lake, (5) the rate of growth, and (6) the degree to which extremely fine watery sediment is separated into layers of wide extent. In the Mississippi delta all these factors seem to favor instability. The thickness is thousands of feet. The front, though not steeper than that of many sand deltas, is very steep for a mud delta, and might be steeper were it not for flowage. The river delivers to the

sea relatively little sand, and most of that is brought at times of high water. The sea does not sort or carry away much of the sediment, so that the delta grows rapidly and layers of sandy silt corresponding to high stages of the river are separated by layers consisting of soft flocculated clay and other fine watery material.

The Tree as a Factor in Man's Adjustment to Hilly and Rocky Lands. By J. Russell Smith. Man's living depends upon plants, and plants upon the soil, requiring, in addition to fertility, heat, light, and moisture. American agriculture has added to these the fifth factor, tillage, which is artificial. By its topographic soil requirements, the plow becomes the limiting factor in production (other than the thin harvests supplied by forest and pasture) for a large proportion of our land that is fit in all respects for heavy plant growth. The tree crop growers of Majorca, Sicily and Corsica show us instructive methods of hill utilization whose results exceed the yields of wood producing forestry or pasture.

THE TOPOGRAPHIC MAP OF MEXICO

(Map facing p. 434.)

Mexico is one of the few Latin-American countries which is issuing a large-scale topographic map of its territory. The official title of the Mexican map is "Carta de la República Mexicana á la 100,000a" and, as the name implies, its scale is 1:100,000, or about 1.58 miles to the inch. The map is published by the Comisión Geográfico-Exploradora, which is under the joint jurisdiction of the Departments of Promotion (Fomento) and War. Two hundred sheets out of a proposed total of 1100 have been published so far (cf. footnote 3). These embrace mainly, as will be seen on the accompanying index map, the eastern part of the country (states of Nuevo Leon, Tamaulipas, San Luis Potosí, Vera Cruz, Puebla, Tlaxcala, part of Mexico, and the Distrito Federal) and certain sections in the north (central Sonora and northern Chihuahua).

The map is subdivided according to the rectangular system, *i. e.* each sheet is a rectangle whose sides do not coincide with parallels and meridians, the projection having been laid out for the whole map as a unit. The whole map is conceived to be divided into nine sheets on the scale of 1:2,000,000, numbered from 1 to 9 (heavy Arabic numerals in block lettering on the accompanying index map); each of these in turn into four sheets on the scale of 1:1,000,000, numbered consecutively from 1 to 24 in so far as they cover Mexican territory (smaller Arabic numerals in Roman lettering); each of these again into four sheets on the scale of 1:500,000, numbered from I to IV (Roman numerals); and, finally, each of these into twenty-five sheets on the scale of 1:100,000, designated by letter as shown on the diagram in the upper right hand corner of the index map. Except for those on the scale of 1:100,000, no sheets have been published, as such, of any of these series, as far as it has been possible to ascertain, although the scales of 1:500,000 and 1:2,000,000 are represented in other official maps, as referred to below. The published sheets on the scale of 1:100,000 are designated according to their position within the two next higher units of subdivision. Thus, the sheets containing Tampico and Vera Cruz are designated respectively 14–I–(Z) and 19–II–(S).

The area represented on each sheet measures 53 by 40 centimeters (20⅞ by 15¾ inches). Relief is represented by unnumbered contours in dark brown with a vertical interval of 50 meters (164 ft.), the elevation, in meters, of critical points being occasionally given in numerals in blue. Drainage and hydrography are in light blue, distinction in color being made, however, between perennial watercourses and dry river beds, the latter being shown by broken lines in brown. Towns, villages, ranches and single buildings are indicated by various symbols in red. Roads and trails are shown in yellow brown, distinction being made between four kinds. Railroads are shown in black, different symbols being used for standard and narrow gauge. Boundaries are also shown in black. All these symbols are explained in detail on a key sheet entitled "Reglamento de signos y caracteres." Every fifth meridian and parallel is drawn out and graduations for every minute are given on the border of the map. Longitude is reckoned from the eastern tower of the Cathedral in Mexico City (99°8′ 0.87″ W. of Greenwich). At the four corners of each sheet are given the designations of the adjoining sheets so far as published. On the lower margin of each sheet are printed: a list of all points on it and on adjoining sheets whose geographic coordinates have been determined; a diagram on the scale of 1:500,000 showing, in colored symbols corresponding to an adjoining list, by whom the various routes were traversed and the extent of previous surveys, if any; the names of the compilers and draftsmen of the sheet; the magnetic declination; and the date of publication. The sheets are printed from zinc plates.

While not based on surveys carried out according to the most refined methods the map fulfills its purpose very satisfactorily. At the beginning of its work the Comisión very wisely decided not to undertake a general triangulation in view of the extent of the country and the limited means at its disposal. Instead, a network is being established of points whose positions are determined astronomically—latitude by circummeridian altitudes, longitude by telegraph or, if not possible otherwise, by chronometer—leaving the intervening areas to be filled in by route traverses with compass and perambulator. Elevations are determined by barometer, the readings being made simultaneously with those of the central meteorological observatory at Mexico City or of temporary stations locally established for the purpose. The maximum errors have been found to be comparatively small: for latitude, half a second of an arc; for longitude, one-tenth of a second of time by telegraph and three-tenths by chronometer; for elevation, 15 meters.[1] Although the map is thus, strictly speaking, only a reconnaissance map, it is very accurate for its class.

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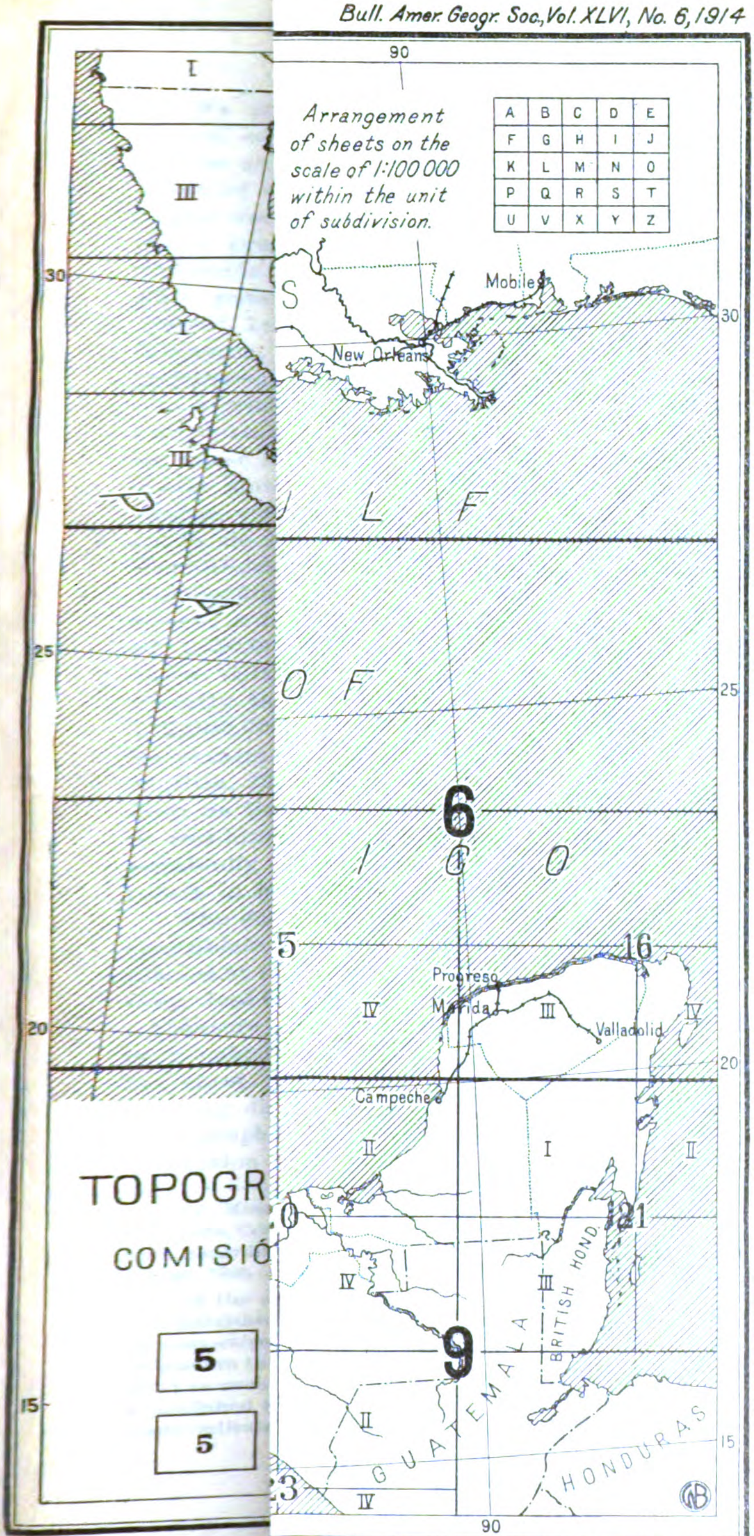
[1] This and other information about the work and organization of the Comisión will be found in the pamphlets issued by it on the occasion of the various expositions to which it sent exhibits, *e. g.* the International Geographical Congress in London, 1895, the International Exposition at Paris, 1900, and the Pan-American Exposition at Buffalo, 1901. These are entitled respectively:

(1) Geographical and Exploring Commission of the Mexican Republic: Catalogue of the Exhibits Presented by the Commission, with a Short Sketch of its Organization and Labors, by the Directing Engineer, Julio Alvarado, C.E. Dept. of Fomento, Colonization and Industry, Mexico, 1895. 67 pp. [In English and Spanish].

(2) Comisión Geográfico-Exploradora de la República Mexicana: Catálogo de los objetos que componen el contingente de la expresada Comisión, precedido de una reseña abreviada sobre su organización y trabajos, por el ingeniero Director Julio Alvarado. Oficina Tip. de la Secretaria de Fomento, México, 1900. 46 pp.

(3) The Geographical and Exploring Commission of the Mexican Republic: Sketch of Its Organization and Labors (title on cover: Some Facts regarding the Geographical and Exploring Commission of the United States of Mexico). By the Directing Engineer, Julio Alvarado, C.E. Printed by Gies & Co., Buffalo, N. Y., no date. 23 pp.

Bull. Amer. Geogr. Soc., Vol. XLVI, No. 6, 1914



As previously stated, no other than the 1:100,000 sheets have been published, so far as known, of the contemplated four series of maps. With these sheets as a basis, however, maps have been prepared of certain states as units, some of which, in scale, coincide with the contemplated 1:500,000 series. These maps are published by the various states themselves, at whose instance they were prepared, although the compilation and engraving was done by the Comisión. As far as known these include the following: Nuevo Leon, 1:500,000, published in 1901 (relief in shading); Tamaulipas, 1:500,000; San Luis Potosí, 1:250,000, published in 1895 (relief in shading);[2] Vera Cruz, 1:250,000; Tlaxcala, 1:100,000, published in 1908 (relief in contours); Morelos, 1:100,000, published in 1910 (relief in contours). These last two maps consist simply of the assembled relevant portions of the 1:100,000 sheets. Surveys are in progress in the states of Hidalgo and Oaxaca which will result in the publication of maps of these states on the scales of 1:200,000 and 1:250,000 respectively. Besides these state maps the Comisión has published several special maps on larger scales, *viz.:* (1) Carta Corográfica del Distrito Federal construida en la Secretaría de Fomento por disposición del Secretario del Ramo, Ingeniero Manuel Fernández Leal, 1:50,000, published in 1899 (relief in hachures); (2) Atlas Topográfico de los Alrededores de Puebla, 1:20,000, in 9 sheets (relief in contours; a reduction with relief in hachures has also been published on the scale of 1:50,000); (3) Carta Topográfica de los Alrededores de Xalapa, 1:20,000 (two editions; relief in contours and in hachures; in manuscript only?). Finally the Comisión has published a general map of Mexico on the scale of 1:2,000,000 entitled "Carta General de la República Mexicana formada en la Secretaría de Fomento por disposición del Secretario del Ramo, Lic. Olegario Molina, 1910," whose scale might indicate some relation to the proposed sheet map on the same scale, although it is drawn and published as a unit. Relief is in red-brown shading, drainage in blue, towns whose positions have been astronomically determined, in red, others in black, roads in yellow brown and railroads in black.

The data here given are based partly on the maps themselves, partly on the pamphlets mentioned in footnotes 1 and 2 and partly on information kindly placed at the Society's disposal last year by the Director of the Comisión, Brig.-Gen. José Gonzalez Moreno, whose unfailing courtesy in answering inquiries it is a pleasure herewith to acknowledge. To him the Society is indebted for the gift of a valuable index map on the scale of 1:2,000,000 showing in hand coloring the sheets published of the 1:100,000 topographic map, on which the accompanying diagram is based[3]; also of the map of the environs of Pueblo and of the pamphlets previously mentioned. The Secretary of the Department of Promotion (Fomento) kindly presented a complete set of the 1:100,000 topo-

[2] *Cf.* Memoria presentada al gobierno del estado por el jefe de la Comisión Geográfico Exploradora, Coronel Julio Alvarado, relativa a los trabajos ejecutados para el levantamiento de la carta geográfica del estado de San Luis Potosí. 19 pp. San Luis Potosí, Tip. Escuela Industrial Militar, 1895.

[3] On the official index map, sheets 14-II-(P), 14-II-(U) and 20-I-(V) are indicated as having been published individually. Inasmuch as the small land area which each embraces is shown on the respective adjoining sheets 14-I-(T), 14-I-(Z) and 20-I-(U) and as these three sheets were not included in the complete set sent to the Society, it was assumed that they have not been published as such, and the accompanying diagram has been drawn accordingly. The proportion of published to proposed sheets given in the first paragraph above, however, includes all the sheets indicated on the official index map.

graphic sheets as well as the general map of Mexico, the map of the Distrito Federal and the maps of Tlaxcala and Morelos; and the governments of Nuevo León and Pueblo sent the maps of their respective states. The 1:100,000 topographic sheets and all the other maps mentioned in this notice, with the exception of the state maps of Vera Cruz, Tamaulipas and San Luis Potosí and the map of the environs of Xalapa, may be consulted at the Society's building.

THE REVOLUTION AND THE MEXICAN PLATEAU

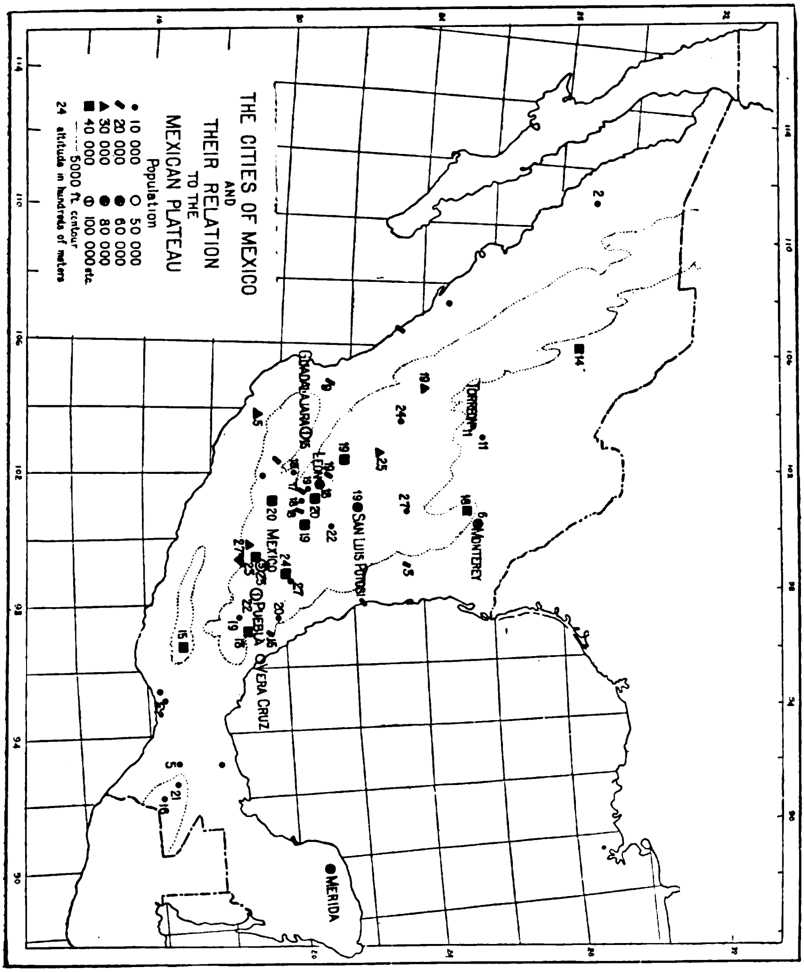
It is not generally realized that the revolutionary area in Mexico is far from the homes of the mass of the Mexican people and above all far below the level at which they live. It is a curiously "upstairs" country. Much the greater part of the people live on a plateau more than five thousand feet above the sea. This plateau area is outlined on the accompanying map with a dotted line. Its association with Mexican life is shown by putting on the map all the towns upwards of ten thousand people in 1910. It is evident at a glance that they are massed especially on the plateau. The population of the towns is roughly shown by the marks that represent them on the map, dots for ten thousand, bars for twenty, triangles for thirty, squares for forty and circles for fifty thousand. Sixty thousand is shown by a dot within a circle and so on, but the names are given of all towns with a population of over fifty thousand. Three cities at the high, southern end of the plateau have over a hundred thousand: Guadalajara (118,799), Mexico (470,659), and Puebla (101,214)).

The revolution has not yet got up to this plateau, holding only the northern country as far south as Torreon and some of the low country about Tampico in the east and south of the plateau border between Mexico and Guadalajara. The only cities of any size that the rebels hold as yet (May 7) are Chihuahua (39,061) and Monterey (81,006). Chihuahua is in the north, just off the plateau border and too far away from the Federal base for the Federals to hold, so they abandoned it. Monterey is also off the plateau, at only 2,000 ft., by far the largest city at so low a level. Seltillo (35,063), near it, is on the plateau, but this the rebels have gone by for the fighting near San Luis Potosí. Torreon is a small place. The population has not yet been reported for 1910, but ten years ago it was 13,800. The *area* held by the rebels is very large, perhaps a third of Mexican territory, but a great deal of it is uninhabited, with certainly less than one and a half of Mexico's fifteen million people, a bare tenth of the population. The task of the rebels is thus still mainly ahead of them.

The cities of forty thousand (the squares on the map), are, from north to south: Chihuahua (39,061), Saltillo (35,063), Aguas Calientes (44,800), Guanajuato (35,147), Querétaro (35,011), Pachuca (38,620); then, west of Mexico City, Morelia (39,160), close to the capital, Tacubaya (35,830), and, toward Vera Cruz, Orizaba (36,189). Oaxaca (37,469) stands isolated on a five thousand foot upland of its own farther south. The cities of thirty thousand (triangles) are: on the plateau southwest of Torreon, Durango (34,085);

southeast of it, Zacatecas (25,905); near the capital, Toluca (31,247); and on lower ground nearer the west coast, Colima (25,148).

Close beside each city symbol is a little number giving its elevation in hundreds of meters. These figures show that the larger cities are on higher ground near the southern end of the plateau about Mexico City, at elevations



of seven or eight thousand feet. The heart of Mexico is now as always most vulnerable from Vera Cruz, on account of the nearness of the thickly settled regions to the sea in that neighborhood, though the ascent is steepest there and the low ground to be passed through most unwholesome. MARK JEFFERSON.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

Regular Meeting of the Society. A regular meeting of the Society was held at the Engineering Societies' Building, No. 29 West 39th Street, on Tuesday evening, April 21, 1914; Councillor Chandler Robbins in the Chair. The following persons, recommended by the Council, were elected to Fellowship:

Sidney Powers, Cambridge, Mass.,	Joseph T. Mulligan, New York City,
J. T. Edwards, Toronto,	August R. Ohman, New York City.

The Hon. Dean Conant Worcester, A.B., Secretary of the Interior of the Philippine Islands, 1901-1913, then addressed the Society on "The Philippines: Our Far-Pacific Outpost." Mr. Worcester very graphically contrasted the Philippines as they were at the time of the American occupancy with the vastly improved conditions of to-day. His remarks were followed with great interest by an audience that filled the auditorium. The lecture was illustrated by many fine lantern views and also by a few moving pictures.

The Society's Latest Exhibition. The Society is showing in its Exhibition Hall a collection of 277 photographs of Porto Rico, 31 of Bermuda, 54 of Constantinople and 59 of notable recent maps. The number of visitors is now averaging over 1,300 a month and is increasing. The Exhibition Hall is open to the public from 10 A. M. to 5 P. M. on week days and from 2 to 5 P. M. on Sundays.

The Memorial Volume. A volume with this title, to be issued this summer by the Society, will contain twenty-six papers written chiefly by European geographers who participated in the Transcontinental Excursion of 1912. The book will be a memorial of that event. Most of the papers are of a technical nature, especially intended for the perusal of geographers; and three-fourths or more of the book will be printed in the German, French and Italian languages. As the work will be a special publication, not included in the current issues from our press, the edition will be limited. Any Fellow who desires a copy is requested to send written application for it to our office not later than June 15, prox., so that a sufficient number may be provided.

NORTH AMERICA

The Next Annual Meeting of the Association of American Geographers. The Council of the Association of American Geographers announces that the annual meeting during the holiday recess, next winter, will be held at Chicago on dates to be announced hereafter. Much interest has been aroused by the two papers on physiographic regions given at the recent meeting at Princeton. The United States Geological Survey is especially interested in the Association's work in this field. The Council has therefore decided that the question of physiographic regions and boundaries shall be the subject of discussion at the next annual round table conference. Professor N. M. Fenneman has been selected to lead the conference.

A Building for Geology and Geography. The University of Chicago is erecting a building for the Departments of Geology and Geography to be known as Julius Rosenwald Hall. The structure will be of stone, steel and cement and will be fireproof. It will cost about $260,000 exclusive of furnishings, and is expected to be completed by November 1.

The Fur-Seal Commission. The President and the Secretary of Commerce having approved the recommendation of the Commissioner of Fisheries, a commission has been appointed to visit the Pribilof Islands this season. The three members are Mr. Edward A. Preble, assistant biologist of the Bureau of

the Biological Survey; Mr. Wilfred H. Osgood, of the Field Museum of Natural History, Chicago; and Dr. George H. Parker of Harvard University. The commissioners will reach the seal islands on a revenue cutter late in June and will remain until the second week in August. They will ascertain the condition of the seal herd, study the relations and obligations of the government towards the herd, the fur trade, and the scientific and economic questions involved in the administration of the seal herd.

Surveying with an Auto Truck. Mr. C. V. Hodgson, of the Coast and Geodetic Survey, has recently left Washington to take charge of a party for the determination of the astronomic latitude of triangulation stations established by the Coast and Geodetic Survey and the United States Geological Survey, between Barstow, Tex., and the Pacific Ocean. Many of these stations are on mountains as much as 10,000 feet in height. The results of this work will be used principally for geodetic purposes, in other words, for the determination of the figure of the earth and the distribution of material in the earth's crust. The means of transportation will be an automobile truck which was used successfully on similar work between Denver and the Canadian border in 1913. Such a truck was employed also in 1912 on the forty-ninth parallel boundary survey between the United States and Canada. The cost of the work in 1913 was estimated as only half what it would have been if horses and wagons had been used for transportation. The saving, this season, will be even greater as the country to be traversed is arid or semiarid and the transportation of water and forage for stock would be a difficult problem. Work will continue until late in the autumn. In experience with the truck in 1912 it was found that a field party and its equipment could cover easily from seventy-five to one hundred miles in a day, over indifferent roads, including stops for gasoline, supplies, etc. The machine is equipped with solid rubber tires, dual behind, and with extra tanks for gasoline and water. Its weight is about 6,100 pounds and the weight of the entire outfit, including the survey party, is over four tons.

Drift Sheets in Iowa. The State Geological Survey of Iowa has recently published a map of the state showing the outlines of the Wisconsin, Iowan, Illinoisan, and Kansan drift sheets, and of the Driftless Area (Iowa Geological Survey, Vol. XXI, 1912, Plate III, 1:1,000,000.) It has been compiled from the larger scale county maps by Calvin and his associates. Excellent as this map is, it seems a pity to have lost the opportunity of presenting, on the same sheet, what is known of the distribution of striæ, something of the position of recessional moraines and outwash gravels, and an indication of the location of the heavily loess-covered parts of the state. This, in its entirety, may be at present impossible, or it may be planned for later publication. The existing map deserves commendation and will be of great help to teachers of physical geography. LAWRENCE MARTIN.

Glacial Lake Agassiz. The northern border of glacial Lake Agassiz has now been more closely defined than in the well-known monograph of Upham. The new work has been done by the Geological Survey of Canada (W. McInnes: The Basins of Nelson and Churchill Rivers, *Memoir 30*, Ottawa, 1913, pp. 125-127; map). McInnes shows that the distribution of glacial lake clays determines the outlines of the northern portion of Lake Agassiz, at whose borders the beaches are not well developed. The outline sketch map shows a greater extension than was thought by Upham to have existed, a part of the lake extending 150 miles or more northward and terminating within the drainage basin of the Churchill River. This stream, rather than the Nelson River, was probably the latest outlet of Lake Agassiz. Most of the clays, which are so thick in places as to dominate the topography, seem to have been laid down after Lake Agassiz abandoned its outlet to the south through Minnesota. LAWRENCE MARTIN.

Coal Fields of Western Canada. The Canadian Northwest at first appeared to lack one of the most necessary qualities for a great future—ade-

quate sources of power. Its remote position with respect to eastern and central coalfields, and the 600 miles that separated it from the known deposits of British Columbia put an almost prohibitive tax on rail-transported coal. The pioneer in his prairie home required it for fuel, the threshing engines required it, and it might be the very basis of success of the Hudson Bay Railroad now in process of construction. Canadian railroads have always been heavily subsidized by the government on account of their function as pioneers in the habitable lands of southern Canada. Coal deposits near at hand would at least partially relieve both government and railroads. Under these circumstances, exploration was directed to the most promising outcrops; and the reconnaissance surveys of the government have now revealed the extent and nature of the available deposits. Their importance is shown by the fact that the coal industry has grown 500% in the last eight years. For 1913 the output is reported to be over 4,000,000 tons, about one-quarter of which was exported to other provinces of the Dominion and to the United States (*Daily Cons. and Trade Repts.*, April 11, 1914.) Coal reserves in Alberta are estimated at a much greater figure than for any other Canadian province; they are said to be 110 times that of Nova Scotia, as yet the largest producing region. The coal is mainly lignite but becomes bituminous in character on approach to the Rocky Mountain foothills. The Belly River fields occupy a large portion of southeastern Alberta. The coal is bituminous with lignite seams on the borders as at Lethbridge and Medicine Hat. A detached area of this formation occurs some 250 miles northwest of Edmonton and Dunvegan in the Peace River Valley, one of Canada's latest "boom" areas. West of the Edmonton fields is a third field most extensively developed in the ranges near the international boundary line and diminishing northward.

Coal interests have recently become deeply interested in a new anthracite deposit that yields hard and relatively smokeless coal like that in Wales and Pennsylvania. Its value is bound to be extraordinarily high not only because of its size and quality but also because of its favorable geographical position. It may easily become a distributing center for the naval bases of the Orient as well as for the new coaling stations in our Pacific ports after the opening of the Panama Canal. The probable supply is estimated at considerably over 1,000,000,000 tons, about three-quarters the amount originally computed for Pennsylvania. The deposits are located near the seaboard, comparing favorably in this respect with the Pennsylvania fields. The charter for the 150-mile railroad necessary for the exploitation of the deposits has already been secured, and a large and well-protected port site selected at Nass Bay, mouth of the Nass River. ISAIAH BOWMAN.

New Experimental Farms in Canada. The Department of Agriculture of British Columbia has selected Fort Fraser as headquarters for the system of experimental farms that will be opened this summer. At Fort Fraser, 372 miles from Prince Rupert, the new Pacific port, will be opened the principal agricultural station from which the entire system of stations will be managed. Experiments will be made in mixed farming for the guidance of settlers now moving into that part of British Columbia.

Importance of Prince George, B. C. Prince George, on the upper Fraser River, was a mere hamlet two years ago, but the building of the Grand Trunk Pacific has given it prominence. All the agricultural land for miles around is now occupied. Some time ago the town was divided into building lots. The Grand Trunk Pacific R. R. has now sold all its town lots at auction for over $2,500,000. The government of British Columbia owns one-fourth of the lots in Prince George and announces that it will sell its holdings during the coming summer. It is conceded that Prince George will become the clearing center of central British Columbia. It is situated on a flat table-land in the angle formed by the confluence of the Nechako and Fraser Rivers and is the point where the Pacific Great Eastern R. R. from Vancouver will join the Grand Trunk Pacific main line and proceed northward into the rich Peace River District.

SOUTH AMERICA

The University of Pennsylvania Museum Expedition. A note from Mr. G. B. Gordon, Director of the University of Pennsylvania Museum, says that the expedition sent out last year to the Amazon, under the leadership of Dr. William Curtis Farabee, reached Georgetown, British Guiana, on April 20, by way of the Corentyn River from Brazil. Letters will probably be received soon giving further information of the journey and some account of the collections made. The expedition was sent to the Amazon Valley to study the aboriginal inhabitants, explore the forests where these primitive peoples live and make collections. The party left Philadelphia in March, 1913, on their steam yacht. The plans of the expedition were described in some detail in the *Bulletin* (Vol. 45, 1913, pp. 369-370). It is supposed that the expedition, having completed its work along one or more of the northeastern tributaries of the Amazon, will now return to the Amazon by sea to continue its task.

Barranquilla to be made a Seaport. Press despatches announce that the President of Colombia has signed a law providing for the opening of the bar at the mouth of the Magdalena to give sea-going vessels access to Barranquilla, the commercial metropolis of the country. At present goods and passengers bound for that place are landed at Savanilla and transported by narrow gauge railroad to Barranquilla. The new channel in the Magdalena will admit vessels drawing thirty feet of water. Piers and warehouses will be erected at Barranquilla which is the starting point for the flotilla of river steamers plying on the Magdalena River.

Agricultural Lands in Argentina. Argentina, with an area of 1,153,119 square miles, has a population of only 7,172,000. The slow progress of colonization has been attributed in part to the difficulties of obtaining land. This should be amended by the present Government policy whereby the purchase of large estates is prohibited. Of the lands best suited for tillage or grazing and set apart for colonies not more than 494 acres for agriculture or 6,178 acres for pasture may be bought by the individual purchaser; of the remaining lands not more than 49,421 acres can be leased or half this ultimately purchased (*Daily Cons. and Trade Repts.*, Nov. 20, 1913). Public lands are difficult to procure in the central provinces of Buenos Aires, Santa Fé and Córdoba but many private sales are effected, the large estates of these provinces disintegrating under pressure of increasing population.

Prices of land vary greatly, chiefly according to the controls of rainfall, water supply, soil, and proximity to the railroad. The highest values are found in the great cereal-producing region of the central provinces. In Buenos Aires, favorable lands not more than 20 miles from the railway realize from \$34 to \$60 per acre. Towards the northeast values rise; dairy farming lands, adjacent to Buenos Aires, reach more than double these values. Southeastern San Luis, a little more remote than the southern parts of Santa Fé and Córdoba, but enjoying similar conditions, averages \$17 to \$43 per acre; in the northwestern part of the same province, with less reliable water supply and farther from the railroad, \$3.50 to \$10. The Andean provinces of Mendoza, San Juan and La Rioja show various prices according to the highly varied physical conditions, distance from transportation lines, etc. The northern territories Chaco, Formosa and Misiones, have been little developed. The census of 1908 credits Chaco and Formosa with populations under .5 per square mile. Lands are rated from \$2.50 upwards. The resources that have attracted most attention up to the present are quebracho and maté; the land, however, is also suitable for corn, rice, tobacco, cotton and sugar. The greatest advances may be expected in sugar production. Already large estates have been developed east of Salta and Jujuy in the well-watered belt along the common border of mountains and plain. The southern territories, more particularly Rio Negro, Chubut and Santa Cruz, are still undeveloped; the population of the last was under .02 per square mile in 1908. Land values average \$1.25, and upwards. While these areas have been almost exclusively pastoral, La

Pampa now shows great agricultural development and like changes will arise in Neuquen with the completion of the railroad and irrigation projects now under way. G. M. WRIGLEY.

AFRICA

Banse's Expedition to the Libyan Desert. In January last, Ewald Banse, who has long specialized in the geography of the East, left Germany for Egypt with the intention of carrying on explorations in the Libyan Desert. He had been preparing for his work in this little known region for several years and had collected all the scattered literature relating to the Libyan oases, settlements, caravan routes, mountains, etc., from which he compiled an account of exploration in the great Waste and of our present knowledge of the desert. This paper is appearing in *Petermanns Mitt.* (March, with map, and April, 1914, the final instalment to be printed in the May number), under the title of "Der gegenwärtige Stand der Erforschung der Libyschen Wüste und Tibesti."

With his little caravan consisting of five men, four camels and a donkey, Banse struck west from Alexandria along the line of the Mariut R. R. which the Egyptian government is extending westward from Alexandria, behind the coastal ridges to Dabba, 28° 26′ E. long. (see map, *Petermanns Mitt.*, 1912, No. 1, plate 25). At this point Banse expected to add two camels to his party as water carriers over the desert further west to the Siwa Oasis.

But at Dabba the explorer received a telegram from Mr. Hopman, the German Consul General at Alexandria, saying that the Egyptian authorities had informed the German diplomatic agent at Cairo that it was not regarded as desirable that Banse should visit Siwa or any of the other oases. The explorer was thus compelled to give up his projected enterprise for the present.

He, however, pushed southward into the desert traveling for eight days without meeting anyone, the first two days through steppe and six days through desert where no sign of vegetation appeared. On the seventh day he reached ranges and depressions across his path that made progress difficult and on the eighth day he came upon a very steep mountain wall about 700 feet high, not shown on maps, from which spread out deep and winding dry valleys giving much the impression of the Colorado Canyon region, with slopes so steep that the camels could not descend into them.

He visited Cairo on his return, and writing from Tripoli (March 14, 1914) he said he hoped by next winter, through diplomatic agencies, to make arrangements for carrying out his proposed work in the Libyan Desert.

The Journal of Egyptian Archæology. The first number of a new journal of this title was published by the Egyptian Exploration Fund, London, in January. It will appear quarterly in January, April, July and October, and will deal systematically with all branches of Egyptological studies. The first number contains papers by D. G. Hogarth, A. H. Sayce, W. M. Flinders Petrie, H. G. Lyons and others. The publication is a small quarto, finely printed and illustrated. The subscription price is 21 shillings per annum.

AUSTRALASIA AND OCEANIA

Carl Lumholtz's New Guinea Expedition. A letter from this well-known explorer to Councillor James B. Ford, from the northeastern part of Dutch Borneo, dated February 24, 1914, says that his headquarters at that time were at Tandjong Selor, about 3° N. lat. at the head of the delta of the large Kayan or Boeloengan River. He was spending a few months in Borneo to enlist Dyaks as carriers for his New Guinea enterprise and also to devote some time there to ethnological researches. He had just spent seven weeks in the jungle, west of Tandjong Selor, and had reached an elevation of 2,600 feet among the hills. Jungle covers the entire country including the mountain tops, which must be cleared if observations are made. He had found no particular difficulty in procuring Dyaks for his New Guinea work. They will not serve for less than a guilder (about forty cents) a day and they must also be provided with clothing for high altitude, and with food, mainly rice, dried fish and dried meat. To this outlay was to be added the cost of their trans-

portation to New Guinea and as the explorer's resources amount to only about $9,000 he will be compelled to economize closely. He had, however, a complete and excellent outfit. His Dyaks are admirable workers, worth their hire, and he has also sufficient provisions such as civilized man requires. He expected to start for New Guinea from Java about the middle of this year. The second half of the year is the favorable time for work in southeastern Dutch New Guinea along the Digul River and among the interior highlands. It is his purpose to make a careful study of these highlands, which will take considerable time. Earlier explorers to this region have felt compelled to return without making any extended sojourn among the uplands. When he wrote, two professors of the University of Christiania, Norway, were trying to raise a sufficient sum to enable two men, a Norwegian geologist and a botanist to join his enterprise. He has with him two very competent assistants: a collector of zoological specimens from the Museum in Kuala Lumpur, and a Chinese photographer from Singapore. He was already able to make himself understood in Malay and before leaving Borneo expected to speak it well. This language is essential for the traveler in the regions he is visiting.

EDUCATIONAL GEOGRAPHY

Geography in the Summer Schools

Continuation of the list printed in the May Bulletin (pp. 370-372)

Alabama. University of Alabama, University, Ala. June 11-July 22. A course for common school teachers including the study of methods, and type lessons based on localities, world, grand divisions, states, and the correlation of the subject with other school work, Miss Luther.

California. University of California, Berkeley, Cal. June 22-Aug. 1. The Lands and the Planetary Relations of the Earth—a study of land forms, their origin and changes, relations to life, formation and economic aspects of soil, physical and chemical principles involved in geographical changes, the earth as a planet, map projections, the use of maps, larger geographical features of the continents, reference books and their use, Professor William G. Reed; the Atmosphere and the Ocean—factors controlling weather and climate, physical features of the oceans, etc., Professor Reed.

University of Southern California, Los Angeles. June 29-Aug. 7. Two courses in geography: 1. The Teaching of Geography, Professor James F. Chamberlain; 2. The Geography of the United States, Professor Chamberlain.

Illinois. University of Chicago. First term begins June 15; second term, July 23. Elements of Geography—physical features and the relations of land, air and water to life, Professor Barrows, Associate Prof. Tower and Miss Lanier; Physiography—the earth's features, agencies affecting them, physiographic changes, genetic geography, with elements of meteorology and oceanography, Professors Salisbury and Trowbridge and Assistant Prof. Tarr; Economic and Commercial Geography—factors influencing the production of commodities, commercial and industrial activities of man as influenced by environment, Associate Prof. Tower; Geography of North America—its relation to the world as a whole, its physical features, climates, nature and distribution of natural resources, etc., Miss Lanier; Influence of Geography on American History—for teachers of geography and history, Miss Lanier; Conservation of Natural Resources, Professor Barrows; Geography of South America—with special attention to geographical influences on trade between the United States and South America, Associate Professor Tower; Geographical Influences in the History of the Interior, Professor Barrows; Field Geography—a study of the life and industries of selected areas to be given in September, the field being the Cumberland Plateau and the Southern Appalachians, Professor Barrows; Research Course—advanced work on selected topics for students prepared to undertake semi-independent work, Professor Barrows and Associate Professor

Tower. Three courses in the School of Education: Geography in the Primary Grades, in the Grammar Grades, in the High School, Miss Henderson.

University of Illinois, Urbana, Ill. Mr. Sumner W. Cushing, of the State Normal School, Salem, Mass., will give instruction in physiography and geography at the summer session. He will be assisted by Mr. G. W. Heitkamp.

Indiana. Indiana University, Bloomington, Ind. Physical Geography—lectures, laboratory work and field excursions, Professor E. R. Cumings; Conservation of Natural Resources—special reference to soils, forests and water power, Professor Cumings; University Geological Survey—for advanced students only, with continuous work in the field throughout the summer, Associate Prof. J. W. Beede.

Minnesota. State Normal School, Mankato, Minn. Elementary School Geography to prepare teachers for the state examinations, Professor Arthur G. Whedon; Elementary Physical Geography, Professor Whedon; Teacher's Geography—dealing with the fundamental principles of geography and their relation to life, Professor George J. Miller; Geography of North America, with special emphasis on industrial geography, Professor Miller.

State Normal School, Winona, Minn. Courses in Rural School Geography and the Elements of Geography, Mr. A. D. Polley.

Nebraska. University of Nebraska, Lincoln, Neb. June 8-July 31. Physical Geography—with laboratory and field work, Assistant Professor Filley and Mr. Eaton; Industrial Geography—a general survey of natural resources and their conservation with special emphasis on Nebraska industries, Assistant Prof. Filley and Mr. Eaton; General Geography—a course in the correlation of regional and physical geography designed to be helpful to teachers in the grades and rural schools, Mr. Eaton; Agricultural Geography of Nebraska—designed to present a study of the development and resources of the state with topography, soils, etc., considered in detail, Assistant Professor Filley; Graduate Work—Professor Condra will direct graduate studies for qualified students.

New York. Biological Laboratory of the Brooklyn Institute of Arts and Sciences, Cold Spring Harbor, L. I. June to September. Systematic and Field Botany—designed for students and teachers who wish training in methods of field and systematic study of the flowering plants, combining field and laboratory work, Professor John W. Harshberger, University of Pennsylvania.

Washington. University of Washington, Seattle. Six weeks beginning June 22. The summer school work will consist of a trip through western Washington studying the geology, physiography and the geography of the section, including the San Juan Islands, the Columbia River from Hood River to Astoria, a part of the Washington coast line, Mt. Rainier, industries of important cities, etc., Professor E. J. Saunders.

Wisconsin. University of Wisconsin, Madison. The field courses in geography and geology, in August, under Professor Lawrence Martin, alluded to in the May *Bulletin* (p. 372), are limited to fifteen men, the party living in tents, total expense $55 to $65, the work including the mapping of physiographic features, problems in physiography, geology, glaciation, the relations of geography to human affairs, etc. For further information address Professor Lawrence Martin, University of Wisconsin, Madison, Wis.

PERSONAL

Dr. Cleveland Abbe, of the U. S. Weather Bureau, celebrated his seventy-fifth birthday at Washington, D. C., on Dec. 4 last.

Dr. Wallace W. Atwood of Harvard will continue his field studies during the summer in the San Juan Mountains in southwestern Colorado. These studies involve the working out of the physiographic history of the mountain area, the relationships of that history to the late history of the bordering plateaus and also a report on the present geographical conditions affecting the settlement and development of that part of the state.

Professor N. A. Bengtson will have charge this summer of a complete survey of an area in south-central Nebraska, twenty-four by thirty-six miles in extent. The survey will include geology, soils, water supplies, forest, and industrial development.

Professor Isaiah Bowman will be in New Haven during the summer completing the preparation of a report on his part of the work of the Yale-Peruvian Expedition of 1911.

Professor G. E. Condra will spend the summer in a reconnaissance soil survey of Nebraska and in special studies on water power problems. He is the head of the Conservation and Soil Survey of Nebraska, which has charge of all work pertaining to soils, water power and forests.

Professor R. A. Daly of Harvard will spend the summer in Europe visiting special localities in the British Isles and the Scandinavian Peninsula.

Professor W. M. Davis has been elected a life member of the Imperial Society of the Friends of Natural History, Anthropology and Ethnology in Moscow.

Mr. W. P. Haynes of Harvard will conduct a field course, for five weeks early in July, in Nova Scotia and New Brunswick.

Dr. T. A. Jaggar, Director of the Seismological Laboratory in the island of Hawaii, is on leave of absence in Japan where he is studying the recent volcanic eruptions.

Professor Lawrence Martin, of the University of Wisconsin, has been elected Corresponding Member of the Kaiserlich-königliche Geographische Gesellschaft in Vienna.

Professor George J. Miller, of the State Normal School, Mankato, Minn., will do geographical field work, in August, in the Lake Superior iron region of Michigan and Minnesota.

Dr. Otto Nordenskjöld, Vice-President of the International Polar Commission, has succeeded to the duties of the President owing to the death of Dr. Theodor N. Tschernyschew, the President, and will arrange for the meeting of the Commission in conjunction with the Eleventh International Geographical Congress at St. Petersburg in 1916.

Mr. D. W. Ohern, having voluntarily resigned as Director of the State Geological Survey of Oklahoma, Mr. C. W. Shannon has been appointed as his successor.

Dr. A. Penck, Professor of Geography at the University of Berlin, has received the Founders' Medal of the Royal Geographical Society and the Gold Medal of the Scottish Geographical Society.

Professor Karl von den Steinen, of the University of Berlin, has been elected a life member of the American Anthropological Association, Washington, D. C.

Professor W. J. Woodworth will give a course in field geology in Montana for five weeks beginning early in July.

OBITUARY

ÉMILE GENTIL. The death of this well-known French explorer is reported from Bordeaux, France. He was 48 years old. Between 1895 and 1900 he was associated with Savorgnan de Brazza in the work of exploring French West Africa and laying the foundations of its development. He was prominent in campaigns which ended in the overthrow of Rabah, the native chief in the Sudan, who attempted to prevent the occupancy of the Lake Chad region by the whites. He was Governor-General of the French Congo from 1904 to 1908.

THEODOR N. TSCHERNYSCHEW. This eminent Russian geologist died in St. Petersburg on Jan. 15, aged 57 years. He was one of the leading contributors to knowledge of the geology of Russia and published more than 60 scientific works in the Memoirs of the Geological Commission of Russia and the Bulletin of the St. Petersburg Mineralogical Society. He was also interested in Polar regions, lead an expedition through Novaya Zemlia in 1905 and at the time of his death was President of the International Polar Commission.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

ASIA

Gun-Running and the Indian North-West Frontier. By the Hon. Arnold Keppel. xiv and 214 pp. Ills., index. John Murray, London, 1911. 9s. 9 x 6.

The tribesmen on the turbulent North-West Frontier and the country beyond are constantly seeking new and better rifles with which to arm themselves. The smuggling of arms and ammunition to these hill-men is a business which at times has attained considerable proportions. After the Afridi revolt of 1897 the course of this trade in arms swung round to the North-West Frontier of India. The political history connected with this trade in rifles and ammunition, the means taken to suppress it, and the complications arising therefrom, are well set forth in this book.

WILBUR GREELEY BURROUGHS.

EUROPE

European Cities at Work. By Frederic C. Howe. xiv and 370 pp. Ills., index. Charles Scribner's Sons, New York, 1913. $1.75. 8 x 5½.

The title is too big. Mr. Howe's cities are three parts German and one part British. German cities are held up for our admiration for maintaining efficient, inexpensive public services of water, light, and transportation as well as recreation. They are beautiful and carefully planned, but not popularly administered. Our cities are as much ahead of them in this as behind in efficiency. The wishes of the German citizen are not considered, only his needs, as they appear to a highly trained, efficient person in charge. English cities own their light, water and street cars, which they operate better than private companies, but they are ugly cities and owned by a landlord class which puts huge tax burdens on the tenant-people and hinders further progress with all the power of established authority. American cities are shown to need most of all freedom from state legislation, which denies them initiative. They need home rule to solve their own problems and municipal ownership to enroll their business and professional classes, now identified with private ownership of public services, on the side of the cities. German cities are free from state control and from aristocratic ownership of their land.

MARK JEFFERSON.

Wirtschafts- und Verkehrsgeographie der europäischen Staaten. Mit besonderer Berücksichtigung der Österreichisch-ungarischen Monarchie. Von Josef Stoiser. xv and 311 pp. Carl Fromme, Wien, 1912. Kr. 2.40. 9½ x 6½.

A systematic and able study of the commercial geography of all the countries of Europe with nearly a third of the space devoted to Austria and Hungary. American teachers will find it a valuable work of reference.

Results of Meteorological Observations made at the Radcliffe Observatory, Oxford, in the Five Years 1906-1910. Under the direction of Arthur A. Rambaut. Vol. L. xvi and 130 pp. Henry Frowde, Oxford, 1912. 10s. 6d. 10 x 6½.

The results appear with reasonable promptness. The record is an unusually complete one, including, for example, observations of the amount of ozone

(twice daily) and of four rain-gauges. A somewhat unusual statement concerns the mean yearly horizontal motion of the air, which is given as 108,000 miles. It is a pleasure to look over the data in this volume. The type is refreshingly distinct and the spacing is wide. R. DEC. WARD.

British Rainfall, 1912. On the Distribution of Rain in Space and Time over the British Isles during 1912. By Hugh R. Mill, assisted by Carle Salter. 52d annual volume. 372 pp. Maps. E. Stanford, London, 1913. 10s. 9 x 5½.

Special attention is given to the great rain-storm of Aug. 25-26, which, in East Anglia, reached proportions surpassing those of any previously recorded storm in the British Isles; and to the rainfall of the summer of 1912 in England and Wales, which, although approached in the summer of 1879, was never exceeded in any summer during the last fifty years. Among the "Observers' Notes" is an account of the remarkable "glazed frost" of Jan. 17th. A photograph of one of the beautiful effects produced by this frost forms the frontispiece of the volume. R. DEC. WARD.

En suivant les Côtes de Dunkerque à Saint-Nazaire. Par Marcel-A. Hérubel. Series: La France au Travail. 2ème 6d. xx and 284 pp. Ills. P. Roger et Cie., Paris, 1913. Fr. 4. 8 x 5½.

The author's main concern is to show the activities of his countrymen between Dunkirk and Saint-Nazaire. The relatively shallow depth of sea above the continental shelf has favored the development of species of fish on which Breton fishermen thrive. On the other hand, the Graville smelter near Havre owes its existence to ore transported all the way from New Caledonia. The inhabitants of this northwestern section of France have been subject to racial alterations fostered by their geographical position. The region has been a melting-pot for north European races. Many observers along the coasts of Brittany and Normandy have remarked upon the Saxon and the Viking influence as suggested in the physical appearance of the inhabitants of these two French provinces. The character and bent of mind of the Normans and Bretons strike one also as partaking appreciably of the nature of the Saxon or Scandinavian. LEON DOMINIAN.

Voyage en France. 58e Serie: Calaisis, Boulonnais et Artois. Par Ardouin-Dumazet. viii and 351 pp. Maps, index. Berger-Levrault, Paris, 1912. Fr. 3.50. 7½ x 5.

The previous edition dates back fifteen years and this period has seen large changes in the industry, agriculture, bathing resorts and leading ports of the North Sea and English Channel. Twenty-seven maps and sketches are included in the text and there is a large folding map of the region. The revision is a welcome, and indeed a necessary part of the attempt to make the whole work a complete picture of the country, not failing to include Alsace-Lorraine, the "Provinces perdues," which "l'auteur a pieusement fait figurer dans son œuvre." A. P. BRIGHAM.

Die Berner Alpenbahn (Lötschbergbahn). Dargestellt von Dr. Ed. Platzhoff-Lejeune. 72 pp. Maps, ills. O. Füssli, Zürich, 1913 (?) 7½ x 5.

How easily geographers explain the route locations of the past! This little history of the newest Alpine tunnel records half a century of earnest discussion of alternatives, with a popular vote finally deciding against the dictum of a board of foreign engineers! It may be predicted that the official name "Berner Alpenbahn" will have to yield to the "Lötschberg route."

To get to Italy from Bern one must cross two east and west ranges of Alps with the east-west Rhone valley between. Long since the southern range was pierced by the twelve mile long Simplon tunnel, but the Italian train, emerging from this, had to make a long detour down the Rhone valley to go around the northern range—the Bernese Oberland. Since 1912 this seventy-five mile detour is saved by the piercing of the nine mile long Lötschberg tunnel through the northern range. The Bern folks are now two hours nearer Italy and hope to

see much traffic between Paris and Milan come their way over the French Eastern Railroad. Twenty-nine admirable illustrations. MARK JEFFERSON.

Gates of the Dolomites. By L. Marion Davidson. With a Chapter on the Flora of the Dolomites. By F. M. Spencer Thomson. xvii and 332 pp. Ills., index. John Lane Co., New York, 1912. $1.50. 8 x 5½.

The Dolomites are mountains of magnesium-limestone, usually massed in groups, extending over about a fifth of the Tirol. The Dolomites, proper, have an area of fifty by forty miles. Although they are becoming more and more frequented, there are many parts as yet untraveled by the ordinary pleasure-seeker. Thus these mountains afford recreation not only to those who prefer luxury and society, but also to those who seek the purity and quiet of nature. The author gives full directions regarding the numerous points of interest and how to reach them; the kinds of roads; hotels; guides; normal weather conditions; flora of the Dolomites; history of the Tirolese; and, enlivening the pages, accounts of the author's own experiences and adventures. The book is handsomely illustrated with photographs, and a map. To all who contemplate a visit to the Tirol, this volume is to be recommended.

WILBUR GREELEY BURROUGHS.

Die Geographische Entwicklung des Rheindeltas bis um das Jahr 1500. Eine historisch-geographische Studie. Von Arnold Norlind. xix and 272 pp. Index. Gleerupsche Univ.-Buchhandlung, Lund, 1912. Mk. 5. 9 x 6.

The author reaches the conclusion that the most essential changes in the configuration of the country have been caused by the correction of nature by man. The original inhabitants did nothing to protect the country against the attacks of the sea but rather exposed it more by digging the peat all over the country, thereby contributing to lowering its level. The Romans constructed dams and canals; but after their withdrawal little of their work survived, and it was not until the time of Charlemagne that authentic information was again available. In the interval the Lek seems to have gained at the expense of the former "Old" Rhine, so that the latter soon disappeared, the process being probably hastened by a storm flood which blocked its mouth between 840 and 860 A D. Also the "Krumme" Rhine and the Vecht declined, while the Yssel and the Waal became the leading waterways for the traffic north and west. The relation of the Waal and the Maas seems to have changed repeatedly, the most important change being of a catastrophic nature when, in 1421, seventy-two parishes were destroyed and a perfectly new branch, the Nieuwe Merwede, was formed in consequence of one of the few floods whose actual occurrence cannot be doubted. The formation of the Zuider Zee, on the other hand, seems to have been preeminently the work of the slow normal processes of nature, and that sea is doubtless much older than has generally been supposed. Most of it was already formed in the oldest times when the sea ate away the then unprotected land without anybody noticing or preventing it. Later, in the twelfth and thirteenth centuries, a number of fatal storm-floods did actually occur; but nothing is said in the records about loss of land caused by them, only loss of human life and of cattle being deplored. The fact is, that, at that time, the land was already protected by dikes; when a dike broke, loss of life and property might be heavy, but the dike was rebuilt, and no land lost. There is but one authentic record of actual loss of land—the destruction of the land connection between Enkhusen and Stavoren. It may safely be said that from the beginning of the Middle Ages, loss and gain of land have been about equal in the Netherlands. M. K. G.

Bericht über die Tätigkeit des Königlich Preussischen Meteorologischen Instituts im Jahre 1912. 172 pp. Maps, ills. *Veröffentl. Kgl. Preuss. Met. Inst. Nr. 256.* Berlin, 1913. Mk. 6. 10½ x 7½.

A "report on the activities of a meteorological institute" sounds like a dry and uninteresting summary of details of routine administration; and that is what many such reports are. But the annual report of the Prussian Meteor-

ological Institute is very different. It brings, each year, a big grist of important meteorological papers, as well as the preliminary summary of the Institute's activities prepared by Dr. Hellmann. In fact, over three-fourths of the present volume is taken up with original contributions on meteorological subjects. Of these, the most general interest centers around Dr. Hellmann's account, which has special interest for the student of folk-lore, of the Thuringian "flood" of 1613. This "flood" was caused by a cloudburst over the hilly country about Weimar, and resulted in the loss of 500 lives as well as great loss of stock and of property. Dr. Hellmann has made a thorough study of all the existing writings relating to this "flood"; gives a vivid account of it, and reproduces, in facsimile, the title-pages of twenty-four publications bearing upon the disaster. Among other contributions are papers by E. Barkow, on the structure of the wind; by K. Langbeck, on the storm damage of May 12, 1912, in Germany, and by G. Schwalbe, on the unusual cold of August-October, 1912. R. DEC. WARD.

La Grèce d'aujourd'hui. Par Gaston Deschamps. 12ème édition. 408 pp. Armand Colin, Paris, 1910. Fr. 3.50. 7 x 4½.

Au Pays Russe. Par Jules Legras. 4ème édition. 362 pp. Armand Colin, Paris, 1910. Fr. 3.50. 7½ x 5.

These two books, published in the same year and both "crowned by the French Academy," deserve to be reviewed jointly. They cover, geographically, the greatest portion of eastern Europe, and resemble one another in their treatment of geographical features; but in other matters each book presents the peculiarities, not only of the topics but of the writers themselves. In the far superior work of Mr. Deschamps, although devoted to solid antiquarian studies, the author has successfully avoided "talking shop" in his descriptions. While it is impossible to treat of Greece as a country, and of its people without alluding to its classic past, we are not overwhelmned with excessive shoveling and curiosity hunting. The mention of such meritorious performances appears as a natural component of the subject. Greece would not be Greece without its ancient remains. These remains are so interwoven with nature and nature is so well pictured in true colors that we feel the intimate connection of both. The same may be said of the descriptions of the population of to-day. Be it in Athens or in the country, the characteristics of the inhabitants appear to result naturally from the resources and lack of resources of their land. It is a charming book, full of life well portrayed, of solid knowledge agreeably presented, instructive for the past and present, significative for the future.

Mr. Legras seems to be a successful newspaper correspondent compared with Mr. Deschamps. He writes well, in a sprightly manner, and in his attempts at picturing landscape displays a great fancy for colors and active hunting for tints. His subject is, as far as nature goes, one of great sameness and monotony. The contrast of the enormous plains of Russia with the varied landscape of little Greece is very strong. Mr. Legras paints that monotony very well, while making desperate efforts to relieve it. His principal object, however, is to present the life of the peasantry and the "burghers" at home and in their intimate relations. For the higher classes he has only condemnation, while confessing that he does not know them at all. The book is inspired by personal relations with Count Tolstoy and breathes unbounded admiration for him. It is very entertaining in many ways. His pictures of famine and of the cholera are often ghastly, but may be true.

AD. F. BANDELIER.

Malta and the Mediterranean Race. By R. N. Bradley. 336 pp. Map, ills., index. T. Fisher Unwin, London, 1912. 8s. 6d. 9 x 6.

Up to a point near the end of the second third of the volume this work has a great, though essentially fragmentary, value. Mr. Bradley assumes the reader's acquaintance with preceding archæological research on Malta and its islets. To this he adds in careful detail the highly interesting results of his

own extensive and careful search in the ruins of a civilization now recognized as antedating the European migration of Aryan ancestors. As a continuation of former research this volume will be absolutely necessary to every student of the Maltese. But the final third of the volume, his disquisitions upon the major theme to which Malta is sought to be adjusted, his deductions from his discoveries, that is far other. After reading his chapter in which he equips our earliest English roots with a Hamitic or Semitic ancestry in a mysterious portage by neolithic man through the Kelts, I began to wonder if it were not a jest; for it is only recently that after the review of a work on the Scot in Canada the learned author took me to task for failing to see his little joke. The jest motive seems involved in the suggestion that the militant suffrage appeal and the quips of George Bernard Shaw are a neolithic inheritance. Unfortunately there is a sad gravity about his explanation of the difference in intellectual quality between the dolichocephalic and the brachycephalic. Recognizing that intellectual quality varies with the association centers of the brain and accepting as proven the theory of the neura as establishing the activity of association, he proposes the following conclusion: "Applying this theory to our two shapes of brains, it seems probable that in a long flat brain these numerous and complex connections could not take place so easily as in a round compact one, *where the dendrons would be close enough to intergrapple generally.*" In succeeding pages he develops this thesis and it is altogether the most remarkable contribution to folk psychology that I have ever encountered. WILLIAM CHURCHILL.

L'Albanie Inconnue. Par Gabriel Louis-Jaray. Préface de M. G. Hanotaux. 3ème édition. xxiv and 239 pp. Map, ills. Hachette et Cie., Paris, 1913. Fr. 4. 7½ x 4½.

Few regions are known so meagerly as Albania. The consequence is that although Mr. Jaray's route is in Old Europe, his narrative is entitled to rank as a pioneer contribution. One cannot help thinking, after reading the book, that Albania was better known to the Romans than to the present generation.

The region described should be divided into two sections. The inhabitants of the district between Uskub and Prizrend *via* Mitrovitza may boast of having seen a few civilized travelers. Real exploration of the unknown begins farther west in the mountainous region overhanging the valleys of the Drin. The scenery as well as the customs and appearance of the inhabitants are portrayed. Some of the descriptions of important localities have been written with much detail, that of Uskub for example. The book helps the reader to form a fairly accurate idea of the social conditions prevailing in Albania. The successful attempts of the Albanians to settle in the lowlands surrounding their mountains is recalled. Mr. Jaray shows how, at Ipek, the Albanians gradually dislodged the Servian inhabitants of the surrounding agricultural districts. He does not allude, however, to the favor with which this movement was regarded by the Turkish authorities. The campaigns of the Servians during the Balkan War dealt a death-blow to this Albanian easterly movement. The author has inserted travel data at the end of each chapter full of valuable information. LEON DOMINIAN.

POLAR

The Former Eskimo Settlements on the East Coast of Greenland between Scoresby Sound and the Angmagsalik District. By G. Amdrup. Ills. *Meddelelser om Grønland,* Vol. 28, Afd. 2, pp. 287-542. Copenhagen, 1909. 9½ x 6½.

Of the seven papers in this part three deal with the anthropology of the recently opened east coast: a summation by Knud Poulsen on the anthropology and nosology of the East Greenlanders, a review by G. Amdrup of his exploration of the abandoned Eskimo settlements between Scoresby Sound and the Angmagsalik district, and by W. Thalbitzer an ethnological descrip-

tion of the artifacts collected by Amdrup. At Angmagsalik there are two traditions as to inhabitants along the coast to the north and, in the present conditions of life, inaccessible from this southern settlement. One tradition records the departure of some of the southern Eskimo from Angmagsalik for the unknown north and their failure to return. The other is a much hazier recognition of the fact that Eskimo lived somewhere along the northern coast but had never been seen within the memory of the wisest of the old men.

Capt. Amdrup had brilliant success in running down each tradition. Of the boat migration of thirty souls from Angmagsalik in 1882 he was able to identify the fate, for at Nualik he discovered the ruins of a settlement quite in the southern style of house construction and brought back to Angmagsalik utensils picked up in the ruins which were absolutely identified as having been in the possession of this or that member of the lost migration. The existence of a former population on the northern coast was established with equal success. In every habitable site which he visited Capt. Amdrup found remains of settlement in the shape of house ruins, tent rings and graves. Working in the territory between the discoveries of Holm on one side and Ryder on the other Amdrup explored a line of coast which had never been visited by a white man, and succeeded in establishing the fact that it was once, though no longer, inhabited by Eskimo. WILLIAM CHURCHILL.

Tre aar paa Grönlands Ostkyst. By Ejnar Mikkelsen. 300 pp. Map, ills. Gyldendalske Boghandel, Copenhagen, 1913. Kr. 8. 10 x 7.

The English edition of this work was reviewed in the *Bulletin* (November, 1913, p. 862).

Observations Météorologiques. Par J. Rouch. Deuxième Expédition Antarctique Française (1908-10) commandée par le Dr. Jean Charcot. 260 pp. Ills. Minist. de l'Instruc. Publique et Masson et Cie., Paris, 1911. 11 x 9.

This volume gives a complete account of the meteorological observations during the winter on Petermann I., as well as of during the voyage of the *Pourquoi-Pas?* Rouch, who had charge of the meteorological work and prepared all data for publication, accomplished his task in a most satisfactory way. The hourly observations on Petermann I. extend from February to November, 1909. To the monthly tables of atmospheric pressure, temperature, etc., is added a meteorological journal (p. 89-144) giving day by day a description of the weather and of the meteorological phenomena. Involuntarily, Rouch gives to the reader material for a psychological study of the effects of the antarctic winter. The observations of June 28th till Sept. 12th, in particular, show very plainly how shortage of daylight and then the progressive increase of the length of the day, act upon the imagination of the observer. There is an annual variation of mental activity, of imaginative susceptibility, which seems to be greatly intensified in polar regions. Rouch's journal is good material for the study of this variation. Among the observations of much interest are diagrams of the short barometric waves registered with the aid of Richard's statoscope. Only fourteen of these curves are reproduced. Up to this time extensive statoscopic investigations have never been attempted and therefore the registrations of the French Expedition will probably have an historical interest. HENRYK ARCTOWSKI.

MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY

Das astronomische Weltbild im Wandel der Zeit. Von S. Oppenheim. Series: Aus Natur und Geisteswelt. 2. Auflage. 134 pp. Ills, index. B. G. Teubner, Leipzig, 1912. Mk. 1.25. 7½ x 5.

This edition differs little from the first excepting that a detailed index adds to its usefulness. The first edition appeared seven years ago and the work is recognized as an authoritative, condensed treatment of the development of the science of astronomy from the earliest times to the present day.

Masse und Messen. Von Dr. Walter Block. Series: Aus Natur und Geisteswelt. 111 pp. Ills., index. B. G. Teubner, Leipzig, 1913. Mk. 1.25.

Gives brief attention in the introduction to the origin and development of the science of measurements. The body of the book is devoted to the scientific bases of the existing systems of measurements of space, length, weight, etc., and to thermal, optical and electrical measures and the methods and mechanical means involved in the deduction of the various data.

Leonardo da Vinci e la Cartografia. Di M. Baratta. 28 pp. Officina d'Arti Grafiche. Voghera, 1912. 9½ x 6½.

This appreciation of the famous painter's cartographic products is somewhat marred by perfervid language. Da Vinci's training as an engineer obliged him to be a draughtsman. This phase of his activity has been classified by the author under the two heads of sketch plans and general maps. It is shown that in both the artist's skill enhanced the faithfulness of his map products. General interest must necessarily attach to the list of maps attributed to this great genius who was certainly one of the ablest cosmographers of his day. Reproductions of a few specimens of Da Vinci's maps in this monograph would have enhanced its value. LEON DOMINIAN.

GEOPHYSICS

Land Magnetic Observations, 1905–1910. By L. A. Bauer. 185 pp. Ills. Researches, Dept. of Terrestrial Magnetism. Carnegie Inst., Washington, D. C., 1912. 12 x 9½.

Dr. Bauer has here presented many valuable series of observations taken on land at check stations which are intended to serve as controls upon the observations recorded in neighboring seas.

Erdmagnetismus, Erdstrom und Polarlicht. Von Dr. A. Nippoldt. Sammlung Göschen. 2. verbesserte Auflage. 143 pp. Ills. G. J. Göschen, Berlin and Leipzig, 1912. 90 pfg. 6½ x 4½.

The present edition has been somewhat enlarged to include recent developments in the science. This is a standard work on terrestrial magnetism and a concise treatment of the subject which, though technical in part, is also adapted to a considerable extent for general reading. Its author is one of the best known authorities on the subject.

PHYSICAL GEOGRAPHY

Die Eiszeit und der vorgeschichtliche Mensch. Von Dr. G. Steinmann. Series: Aus Natur und Geisteswelt. 96 pp. Ills. B. G. Teubner, Leipzig, 1910. Mk. 1.25. 7½ x 5.

Discusses the Ice Age, glacial cycles, the action of ice and of water, glacial relief, moraines, changing of river courses, formation of loess and clay, prehistoric man, the age of the human race, and answers many questions such as "how does ice flow?"

Schnee und Eis der Erde. Von H. Wieleitner. Series: Bücher der Naturwissenschaft. 198 pp. Ills., index. P. Reclam, jun., Leipzig, 1913. Mk. 1. 6 x 4.

In this small book are condensed the leading facts in relation to snow and ice, not as meteorological factors but as to their physical nature and properties and the impress they make upon the face of the earth. The book is designed for the perusal of the intelligent laity and fits well into the scheme of the series—the practical popularization of science.

OCEANOGRAPHY

The Depths of the Ocean. A General Account of the Modern Science of Oceanography based largely on the Scientific Researches of the Norwegian Steamer *Michael Sars* in the North Atlantic. By Sir John Murray and Dr. Johan Hjort. With Contributions from Prof. A. Appellöf, Prof. H. H. Gran and Dr. B. Helland-Hansen. xx and 821 pp. Maps, ills., index. Macmillan & Co., Ltd., London, 1912. £1 8s. 9½ x 6½.

Geographers and other general readers will find this an up-to-date treatise on oceanography. The *Michael Sars* is the tiny steam trawler of the Norwegian "fisheries," which has explored the Norwegian Sea in great detail since 1900. Sir John Murray suggested her four months' trip into the Atlantic in 1910; went with her, and bore a generous part of the expense. European shelves and the slopes to the deep ocean were explored as far south as the Canaries, from there the ocean was crossed to Newfoundland *via* the Azores, and return made to Bergen by way of Glasgow.

The intention was to add the light of Atlantic comparisons to the results of the researches of the *Michael Sars* in Norwegian waters. Incidentally a number of stations occupied by the *Challenger* in 1873 were reoccupied, and observations repeated with the improved apparatus of to-day. It is highly creditable to Murray's open-mindedness that he should urge the application of the newest thought and appliances to studies which long ago brought him established fame, and be able to work alongside and through some of the best trained men of 1910.

Dr. Johan Hjort, of the Norwegian "Fisheries," was in command of the expedition and writes the description of the *Michael Sars* and her apparatus, the account of the cruise of 1910, and chapters on bottom fishes, pelagic animals, and general biology of the ocean. Sir John Murray contributes an historical review and 180 pages on the depths and deposits of the ocean. This covers all the oceans, and is illustrated by colored charts of depths and deposits. Murray's general chapters and the narrative of the voyage of 1910 are the main threads of interest, illustrated by the special papers.

At Gibraltar they made the first velocity studies of the upper and lower currents. The westward under-current varied in speed from one fourth knot to five knots. On one occasion it extended from the bottom to the top for an hour, but its usual upper limit was at depths between fifty and 150 meters. The upper current, as was known, is usually to the east. Its speed was found to vary between one and three knots. The changes in the currents coincided in time with tidal changes outside. Temperatures and salinity were thoroughly investigated at all depths in the Spanish Bay outside the Straits. The use of the current meter enabled Helland-Hansen to detect currents with tidal change of "set" in the deep ocean west of the Canaries at depths of 915 and 1,830 meters, the total depth there being 5,000 meters. As the ship had to drift there, absolute velocities were not ascertainable. The same tidal set was observed and a current of a half knot measured across the mid-Atlantic Ridge south of the Azores, where the ship was anchored for fourteen hours in 900 meters, the current meter being at 732 meters depth.

The few catches on the mid-Atlantic Ridge give a hint of greater abundance of life there than over greater depths. Everything confirms the sparsity of life in the greatest depths. There is interest in every page of the volume, and while it notes great progress in knowledge it opens out new fields for study in every direction. MARK JEFFERSON.

La Vie dans les Océans. Par Dr. L. Joubin. In Series: Bibliothèque de philosophie scientifique. 334 pp. Ills. Ernest Flammarion, Paris, 1912. Fr. 3.50. 7½ x 4½.

The author uses very few pictures in his book, which is popular but clear and written with real literary skill. He has selected his matter with care and presents it vividly.

All the properties of the ocean that touch nearly on life are described fully enough to show their bearing. Mainly they are motions, temperature, pressure, composition, and lighting. None are allowed to lead us aside from our object.

This is the more striking as the ocean is the seat of such complexity and variety that treatment of it is always likely to run off into disconnected detail. The parts of the book that deal most with geography are the accounts of corals and the spreading of life into the depths from the sunny continental shelves where it originated, an expansion here dated from the Cretaceous. Depths of 7,000 to 10,000 meters are almost lifeless, yet pressures in the deeps are not so burdensome to life as has been said. Gases are under no extraordinary compression. There is no spouting when the deep water bottle is opened and change of temperature rather than of pressure accounts for the death of the creatures brought to the surface. We have heard of sea phosphorescence, seen a little even, but Joubin gives us an impression of it that is typically novel. We may read Murray's account of the same facts and learn of the same light projectors with lenses and reflectors that the French author describes but it is only the latter who gives a feeling of the radiance of some of these creatures, which suggests to the eyes of the mind occasional regions of submerged splendor. We can almost see some of these fish dart up with all their lateral spots aglow like tiny ocean liners in the night.

The coral chapter is admirable for any one who once learned Darwin's theory of reefs to find it later denied but found the alternatives somewhat unclear. Our author gives seven theories and leaves the impression that all may have application! MARK JEFFERSON.

Étude sur les Marées. Par R. E. Godfroy. In series: Documents Scientifiques, Sciences Physiques. Deuxième Expedition Antarctique Française (1908-1910) commandée par le Dr. Jean Charcot. 74 pp. Maps, ills. Masson et Cie., Paris, 1912. 11 x 9.

The present report forms an important contribution in the domain of Physics to the scientific work of the second Charcot expedition. It is a beautifully printed and arranged document of 74 pages and 11 plates, published under the direction of Professor L. Joubin, of the Natural History Museum, and under the auspices of the Minister of Public Instruction.

The region in which the study was made, forming the connection between the Pacific and the Atlantic oceans, is of the greatest interest to oceanographers. As the author points out, the late Sir George Darwin laid great stress on the importance of obtaining systematic and careful observations of the behavior of the tides in this place.

Previous observations are exceedingly meager, and have extended over too short a period to be of value in establishing a theory of tide movements. We have observations by Scott, Courceille-Seneuil, Bruce, and those made in the first Charcot expedition, but none have been over such an extended period as the present. The expedition, which lasted for thirteen months, was directed between the following stations: (1) Amirauté Bay, South Shetlands, (2) Port Foster, Ile Déception, (3) Port Lockroy, Ile Wiencke, (4) Port Circoncision, Ile Petermann, (5) Marguerite Bay, Ile Jenny. The report is arranged as follows: A description of the tide gauges used, the installation of the apparatus and the difficulties overcome, the method of taking observations, the interpretation of the curves taken with the tide gauges, the method of analyzing the curves, the more important harmonic constants for the various stations, and a set of complete tables of results. Some very fine curves and diagrams are given in the illustrated section at the end of the work, which are arranged so as to bring out in a helpful manner a comparison of the various stations.

The tide gauges used were of elaborate pattern as compared with most work of this kind, and the author's devices for overcoming the low temperature were interesting. The gauge most used was designed by Favré, and made by Richard, but an ordinary Richard gauge was also used to check the results. The instruments are said to have worked perfectly.

The harmonic analysis of the curves was carried out by the well-known method of Kelvin.

The relation of meteorological effects to tide changes was studied, and it was proved to the entire satisfaction of the author that there is a decided barometric effect on the surface of the sea. This is of interest in view of the

report of the Committee of the British Association in 1896 to the contrary. The author finds a movement of 1 mm. in the barometric column to correspond immediately with an inverse movement of the level of the sea, amounting to 1.45 cms.

The author finds the periods of the diurnal and semi-diurnal tides very irregular. The observations show that the diurnal tide is propagated from East to West through Drake Strait.

Although very irregular, the mean value shows a period for the diurnal tide as follows:—At Orange Bay 44 hours, in Scotia Bay 14.5 hours, and 5 hours at Port Foster and Port Circoncision. The same values for the semi-diurnal tide are, 29 hours at Orange Bay, 25 hours at Scotia Bay, 48 hours at Port Foster, and 104 hours at Port Circoncision.

In conclusion, the author emphasizes the great irregularity of the tides in this region, which do not satisfy either the old ideas of Whewell, or those more recent of Rollin A. Harris. His study shows the law of the tides to be very complex and troublesome, although the situation offers a maximum number of the conditions for the theory.

H. T. Barnes,
McGill University, Montreal.

METEOROLOGY AND CLIMATOLOGY

Climate and Weather. By H. N. Dickson. Series: Home University Library. 256 pp. Index. Williams & Norgate, London, 1913 (?). 1s. 7 x 4½.

Not until the ninth chapter does the work become popular. This section entitled "Climate and Vegetation," and the next and last chapter, "Climate and Man," will perhaps make the strongest appeal to the interest of the teacher of elementary geography or to the layman.

The division of the Earth into climatic regions (p. 137) is somewhat different from the usual. It is based upon the wind system including the following divisions: 1. The equatorial belt; 2. The trade-wind belts, north and south; 3. The high-pressure belts, north and south; 4. The west-wind belts, north and south; 5. The circumpolar caps; 6. The monsoon region of south-eastern and eastern Asia; 7. The Tropical; 8. The Sub-Tropical.

The discussion of the monsoon region introduces some interpretations different from those generally presented on the subject. The summary, p. 152, indicates three seasons: "Cold weather, hot weather, rainy."

Eugene Van Cleef.

Nouvelle Méthode de Prévision du Temps. Par Gabriel Guilbert. Avec une préface par Bernard Brunhes. xxxviii and 343 pp. Maps. Gauthier-Villars, Paris, 1909. 10 x 6½.

In April, 1891, Gabriel Guilbert explained to the French Meteorological Society his new practical rules for weather prediction. In 1905 a competition in weather forecasting was held at Liège, and Guilbert received the first prize. The present volume gives the essentials of the new system, with a large number of examples. The essential thing is the isobaric chart of tomorrow. Given the isobars, the normal wind which is to be expected under the given isobaric system enables the forecaster to judge how far, and in what direction, the cyclone (the principal factor in weather-making) may be expected to move, and whether the depression is likely to deepen or fill up. When the winds are not normal, in direction or velocity, the author considers this an indication of the presence of some external influence. The system is then likely to move in the direction of least resistance, indicated by the deviation of the (actual) winds from the normal.

This whole new scheme has attracted considerable attention among meteorologists the world over, and it is safe to say that since the publication of Guilbert's book many forecasters have been putting his ideas into practice. The volume is hardly one that will appeal to the general student of meteorology, but those who want to be fully informed regarding the progress of the science in all its branches will not wish to be ignorant of it. The Preface is by

Brunhes, Director of the Puy de Dôme Observatory, who, it may be noted, is not entirely in agreement with all of Guilbert's ideas. R. DEC. WARD.

Die Schneegrenze in verschiedenen Klimaten. Von Dr. Viktor Paschinger. 93 pp. Maps, diagrams. *Ergänzungsheft No. 173 zu Pet. Mitt.*, Gotha, 1912. Mk. 7.80. 11 x 7½.

The height of the snowline, and its controls, have been investigated by many writers, among whom de Saussure, von Humboldt and Ratzel may be mentioned. Heim (*Handbuch der Gletscherkunde*, pp. 18-21) and Berghaus (*Behm's Geogr. Jahrb.*, Vol. I, pp. 258-267, Vol. V, p. 472) have given tables of the heights of the snowline in different mountains. In his *Handbuch der Klimatologie*, Vol. I, 3d. ed., von Hann gives an excellent summary of this whole matter. Those who have concerned themselves with the snowline have, however, for some time felt the need of a further and a more thorough investigation of the question, in the light of the latest and most complete data now obtainable. Dr. Viktor Paschinger, of Graz, has given us the desired monograph—a very complete and satisfactory presentation of what is, for many reasons, a difficult and confusing subject. Nearly two-thirds of the report is taken up with a detailed summary and critical examination of the data concerning the height of the snowline in all parts of the world, with copious references to the authorities. The remaining third deals with the relations between the snowline and the climatic elements. The author clearly recognizes that the snowline is essentially the resultant of climatic controls, and that, therefore, an investigation of the snowline is an important subdivision of climatology. Perhaps the most interesting of the plates is the curve showing the altitude of the snowline at different latitudes, from 80° N. to 65° S. R. DEC. WARD.

Luft- und Meeresströmungen. Von Dr. Franz Schulze. Sammlung Göschen. 149 pp. Maps, ills., index. G. J. Göschen, Leipzig, 1911. 80 pfg. 6½ x 4½.

The principal object of the book is to serve as an aid to young German seamen in their preparation for their examinations for the position as captain. It aims to condense, within the limits of 150 small pages, the most important facts concerning the winds and the ocean currents. A short introduction explains, for the benefit of the layman, the meaning of some of the more common nautical terms. The author is Director of the School for Navigation at Lübeck, has had nearly thirty years' experience in teaching navigation, and was at sea for ten years. The title is somewhat misleading, in that, under *Luftströmungen*, such special winds as the föhn, mistral, bora, etc., as well as tropical cyclones and tornadoes are considered. The little book therefore really deals with the whole subject of winds, as well as with ocean currents, and it does this in a very clear and satisfactory manner. R. DEC. WARD.

Brief List of Meteorological Textbooks and Reference Books. A selection of works suitable for general, scientific, and university libraries in the United States. 3d edition. By C. F. Talman. 22 pp. Index. Weather Bur., Washington, 1913. 9 x 6.

The Weather Bureau has recently issued the third edition of the useful Bibliography prepared by Professor Talman. We have here about 150 titles, carefully selected, classified and indexed, and brought down to date, the whole forming an excellent "working" bibliography for teachers and students of meteorology and climatology. In these days of the rapid increase of meteorological literature, this selected list of titles will prove very acceptable to those who are making a serious study of the science of the atmosphere.

R. DEC. WARD.

Contribution à l'Étude des Relations existant entre les Circulations atmosphériques, l'Électricité atmosphérique et le Magnétisme terrestre. Par Alfred Vialay. viii and 200 pp. H. Dunod et E. Pinat, Paris, 1911. Fr. 6. 10 x 6½.

The author has endeavored to correlate the general atmospheric circulation

with the phenomena of atmospheric electricity and of terrestrial magnetism. His views are generally at variance with those which are commonly held today. For example, on the purely meteorological side, he believes that the ordinary explanation of the monsoons of the Indian region is absolutely wrong. The author has evidently read widely, but his book is not one which is likely to have many readers, nor will his views have many supporters. R. DEC. WARD.

Atlas photographique des Nuages. Par Julien Loisel. 20 ills. G. Thomas, Paris, 1912 (?). 14 x 10½.

We have here some very beautiful reproductions showing even the minute details of cloud structure. When such remarkable photographs are available, we are almost reconciled to the absence of color in the pictures. There are five photographs of cirrus; eight of alto-cumulus; one of alto-stratus; three of cumulus; one of nimbus; one of cumulo-nimbus, and one of strato-cumulus. The author, unfortunately, has not followed the International Cloud Classification, and this fact will militate against the general use of this otherwise most acceptable atlas. It is a pity, when international agreement has accepted a certain cloud classification, to have authors adopting and advocating an independent scheme. R. DEC. WARD.

PHYTOGEOGRAPHY AND ZOOGEOGRAPHY

Plant Physiology with special reference to Plant Production. By Benjamin M. Duggar. Rural Text-Book Series. xv and 516 pp. Ills., index. Macmillan Co., New York, 1911. $1.60. 7½ x 5½.

The progress of agriculture is becoming increasingly dependent upon the application of the facts and principles of plant physiology, and at the same time both investigation and instruction in plant physiology are coming to bear a closer relation to the service which may be rendered to agriculture. The college text-book under notice is an outcome of these tendencies, and is also calculated to strengthen them.

Professor Duggar has placed special emphasis on the growth of nutrition of plants and on the allied functions, and has touched lightly on the tropisms and such subjects as growth movements. The treatment of transpiration, the water requirement of plants, and mineral nutriments is particularly strong, and, throughout the book, illustration of physiological principles by practical results in plant production is calculated to stimulate the interest of the student. The topics are so handled as to suggest the desirability of more knowledge, and the copious literature references will lead the student to original sources.

FORREST SHREVE.

The Life of the Plant. By C. A. Timiriazeff. Translated from the revised and corrected seventh Russian edition by Miss Anna Chérémételf. xvi and 355 pp. Ills. Longmans, Green & Co., New York, 1912. $2.50. 9½ x 6½.

In 1878 Professor Timiriazeff, of the University of Moscow, published a series of lectures on the physiology of plants, the popularity of which has carried them through seven Russian editions.

The series was recently revised and translated into English under the title "The Life of the Plant." The book is an admirable semi-popular representation of a scientific field which has a forbidding look to many.

The ten lectures are arranged on a plan which emphasizes throughout their progress, the close interrelation of function and structure in plants. The field of plant physiology is oriented with relation to other sciences, both historically and philosophically, and some of the larger problems of biology are touched upon.

The author was one of the early adherents of the mechanistic view-point in physiology, to which he adheres throughout these lectures both in spirit and in language. The use of the words "adaptation" and "adapted," in the English translation, may cause some alarm as to the soundness of the author's biological philosophy, but there is no occasion for it. From a strictly technical

standpoint the facts in Professor Timiriazeff's book are not brought down to date. While it is easy to find faults in the scientific statements in such a book, it is not easy to find specialists who are both willing and able to write books for the general reader.

The tasks and aims of plant physiology are in serious need of being better known to a wider audience, and The Life of the Plant is one of the few books through which this may come about. FORREST SHREVE.

Animal Geography. The Faunas of the Natural Regions of the Globe. By Marion I. Newbigin. The Oxford Geographies. 238 pp. Ills., index. Clarendon Press, Oxford, 1913. 4s. 6d. 7½ x 5.

In treating of organic responses to physical laws, most attention is here centered on plants and mankind. Animal geography has scant attention, but the author has blazed the trail to an interesting and important phase of geographical study. The globe is divided into eight natural regions, as the tundra, the coniferous forest, the steppe, etc., and the fauna of each are described. The presentation under each type is strictly geographical following the logical order of causes and effects. The reader is introduced at the outset to the physiographic controls of the regions and then follow the general responses of all animal life as in migration and the specific responses of individual species. The book will be found of great value. ROBERT M. BROWN.

ANTHROPOGEOGRAPHY

Ancient Town-Planning. By F. Haverfield. 152 pp. Plans, ills., index. Clarendon Press, Oxford, 1913. Oxford Univ. Press, New York. 6s. 9 x 6.

This volume is but an essay toward a primer of the elementary study of this newly constituted branch of demography. The author outlines the initial condition of civic communities in the Greek and Latin culture areas. In the latter he seems somewhat slurring in his disposition of an important element. In his preface he comments upon the terms *scamnirt* and *strigirt* as unpleasant, needless and inaccurate. The pleasure lies in the German treatment of Latin material after Germanic habit. We may readily employ the terms according to the genius of our own speech as scamnate and strigate. We should regret to lose the precision of these terms of the ancient surveyor's art, for according as land was divided as scamnate or strigate we are brought into touch with the origin and character of the town street, as common or king's highway on one side, or as path of temporary convenience becoming by right of user an indefeasible easement. This division is essential in the study of the manner of growth of any town, whether ancient or modern.

Prehistoric Times as Illustrated by Ancient Remains and the Manners and Customs of Modern Savages. By the late Rt. Hon. Lord Avebury. Seventh edition, 623 pp. Ills., index. Henry Holt & Co., New York, 1913. $3.50. 9 x 6.

Recounts the latest facts and theories concerning the prehistoric traces of man. Its especial value is that it affords the educated man who is without special training an opportunity of acquainting himself with all the facts from which the age of man upon earth must be calculated, of making himself familiar with the latest scientific conclusions from these facts and of forming an opinion of his own. The chapter on the antiquity of man inclines to the view that man or some semi-human ancestors of man existed in Pliocene times, and that the predecessors of man in Miocene times were sufficiently advanced to make use of rude stone implements. The concluding chapters treat of modern savages as throwing light on their prehistoric progenitors.

DAVID H. BUEL.

HISTORICAL GEOGRAPHY

Journal of Jasper Danckaerts, 1679-1680. Edited by Bartlett Burleigh James and J. Franklin Jameson. Series: Original Narratives of Early American History. xxxi and 313 pp. Ills., index. Charles Scribner's Sons, New York, 1913. $2.50. 9 x 6.

The introduction by Dr. James has the following very just characterization of the book and its author:

"Danckaerts viewed his surroundings through the eyes of a fanatical self-satisfaction. For this reason his criticisms or strictures upon persons and conditions are to be received with much discount. But he was an intelligent man, and a keen-eyed and assiduous note-taker; and the variety and fecundity of his material is not a little due to the trivial and relatively unimportant details which are embodied in the narrative."

After such a masterly and concise review not much more need be said. Mention, however, should be made of the two introductions—the first by Dr. James, the second by Dr. Jameson, if only to signal the value they have in acquainting us with the historic status of the religious and communal sect founded by Jean de Labadie, and for which Danckaerts and his companion, Sluyter, traveled to America to explore the eastern coastlands, and in consequence of which a Labadist community was afterwards founded in Maryland. The results of these explorations are an exceedingly minute description of New York and its surroundings, of the Hudson, Albany, and as far as west of Schenectady, of New Jersey, and parts of Delaware and Maryland to the line of Virginia. Geographically this description is highly valuable. It presents a vivid picture of the country as it was in 1679, and of its flora, fauna and hydrography. Careful notes on the weather of every day, while not precise, of course, still afford points of comparison with climatic conditions of later periods when properly scrutinized. Not less interesting is his ship journal for the abundant notes on conditions of the sea. Danckaerts's previous voyage to Surinam in Guiana had evidently opened his eyes to many maritime and nautical phenomena. It is noteworthy that he places the origin of the Gulf Stream at the mouth of the Amazon.

Descriptions of larger towns and cities like London, New York, Boston, are somewhat distorted by his patriotism as a Hollander, but his picture of everyday life in streets and homes is interesting while not always complimentary to the people. The remarks of Dr. James about exaggerated critical inclinations in that direction are to be treasured. On the whole the book yields much more than the title leads one to expect, and the editors deserve thanks for what they have undertaken and successfully carried out.

AD. F. BANDELIER.

The Vikings. By Allen Mawer. Cambridge Manuals of Science and Literature. 150 pp. Ills., index. University Press, Cambridge. G. P. Putnam's Sons, New York, 1913. 1s. 6½ x 5.

The term "Viking," meaning "one who haunts a bay, creek or fjord," came to be used, in the ninth and tenth centuries, to designate those warriors of Scandinavia who raided the chief European countries. Until within the last half-century our knowledge of these people was obtained almost entirely from the works of mediæval Latin chroniclers who, writing in monasteries and similar places of learning, had often felt the ruthless hand of the Viking freebooter. Naturally, therefore, the Vikings' cruelty and violence is emphasized and made predominant in the picture which these early historians drew.

During the past fifty years, however, a more comprehensive picture has been given us of the Vikings. This latest conception is obtained from early Scandinavian literature and through the work of archæologists of the last century. The word "Viking," in its recent broader meaning, includes that entire period of Scandinavian civilization, conquest and influence extending approximately from the middle of the Eighth to the end of the Tenth, or the first half of the Eleventh Century. Mr. Mawer deals concisely and in an interesting way with the Vikings in this wide and inclusive sense.

WILBUR GREELEY BURROUGHS.

The Municipalities of the Roman Empire. By James S. Reid. xv and 548 pp. Index. University Press, Cambridge. G. P. Putnam's Sons, New York, 1913. 9 x 6.

A most valuable work. It is not a book to be cursorily read. It must be carefully studied. Not a word, still less a sentence, is to be overlooked, lest the thread be lost in the enormous accumulation of facts. The treatment of these facts is, however, logical but of rare terseness. It may be said that there is a decided leaning towards admiration of everything Roman, yet it is not at all offensive, and justice is done to other influences not emanating from Latin sources. Dr. Reid's appreciation of Hellenic culture and its intellectual power in the Roman world is not only just but, in many instances, highly complimentary. In a word, he judges with great impartiality and always on the basis of vast material. The book gives an exceedingly detailed picture of the political geography of the Roman Empire and its gradual development. There is hardly a settlement that is not mentioned and, what is most important, accurately located as far as possible. The book may be regarded as a political map of ancient Rome in words; and much is given regarding the physical geography of the vast area covered, hydrography, orography, the vegetation as far as culture plants, indigenous and imported, affected Roman civilization and were in turn affected by it. In short, it is a vivid description of the land of ancient Rome, its people and its vicissitudes to the Fifth Century, the time of its dissolution. AD. F. BANDELIER.

Geschichte der Türken. Von Dr. Albrecht Wirth. 2. verbesserte und vermehrte Auflage. 115 pp. Ills., index. Franckh'sche Verlagshandlung, Stuttgart, 1912. Mk. 2. 10½ x 7.

This is an essentially popular sketch of Turkish history in Europe which will serve the purposes of ordinary reference. The upheaval of the Balkan States provided the occasion for this edition in which the record of events has been brought down to December, 1912. Without pretence of being more than an occasional book and in no sense intended to take the place of greater historical treatises this brief narrative will be found to contain an astonishingly large amount of those details of Turkish history which are in general so hard to find. The richness of this detail would have been brought to better use by an index better than that which the volume has received.

The History of the Italian-Turkish War, Sept. 29, 1911, to Oct. 18, 1912. By Commodore W. H. Beehler. 118 pp. Maps. Reprinted with additions from *Proceedings of the U. S. Naval Institute.* W. H. Beehler, Annapolis, Md. $1. 9½ x 6½.

Based upon semi-official and other reliable data. A straightforward account of the origin, progress and conclusion of the war by a distinguished naval officer who describes the conditions under which war was made and tells the whole story without technical detail, mentioning all facts that were important in shaping events and results.

ECONOMIC AND COMMERCIAL GEOGRAPHY

Mémoire sur les Travaux du Conseil Permanent International pour l'Exploration de la Mer pendant les Années 1902-1912. Redigé par C. F. Drechsel. 83 pp. Copenhagen, 1913. 10½ x 8½.

Published in German and English. The International Investigation of the Sea has been carried on by all the countries bordering on the North Sea and the Baltic for eleven years. The United States is in future to participate in the work. The International Council in September last year decided that a memorandum should be prepared, with the assistance of special experts, on the organization of this work, its programme and the results thus far achieved. The work has been comprehensive and the regions studied have included large parts of the Atlantic from the Arctic circle to the coast of Africa, the North Sea and the Baltic, with the waters between them. The Mediterranean also has, at times, been the scene of observations.

The Bureau has published an important amount of literature, giving the results of this study. This material is available to all who desire to study closely the results of the work. This memorandum, however, is most welcome because it gives the results in concise form conveying to any intelligent reader a good idea of the purposes and work of the Bureau. The memorandum is divided into two parts, the first giving the objects, programme, and organization, and the second describing the work carried out and its more important results. The most essential object of investigation is to procure the necessary data for international agreements as to protecting fisheries from overfishing and the establishment of measures for the improvement of the fisheries.

Maritime Enterprise, 1485-1558. By James A. Williamson. 416 pp. Index. Clarendon Press, Oxford, 1913. Oxford Univ. Press, New York. $4.75. 9 x 6.

One of the themes in this work is to make it plain why England, with a more modern record of dominance of the sea, was so backward in coming into enjoyment of the great discoveries in the Americas. Contributory to this theme is a careful study of the character of Sebastian Cabot. Mr. Williamson, with the aid of fresh study of the evidence, reaches the conclusion that, while Sebastian was a not particularly noble seafarer nor bigoted in his veracity, yet he was not so complete a liar as has been thought. The maritime backwardness of England is analyzed in its connection with the laws of trade based upon the wholly medieval foundations of the wool staple and cloth industry. The writer closes his investigation at the point where the English merchants were ridding themselves of the distributing machinery of the Hanseatic League and taking over command of sea carrying trade for themselves. The work thus serves as a very satisfactory introduction to Froude's "English Seamen of the Sixteenth Century." WILLIAM CHURCHILL.

The Geology of Soils and Substrata, with special reference to Agriculture, Estates, and Sanitation. By Horace B. Woodward. xvi and 366 pp. Ills., index. Longmans, Green & Co., New York, 1912. $2.50. 7½ x 5.

This book contains a vast amount of information concerning soils and bed rock in a great variety of relationships. It is written largely from the point of view of England and Wales and is intended for a practical treatise for students and teachers of agriculture, superintendents of estates and engineers. The first part of the book is a general discussion with a wide range of subjects; weathering, analyses, fertility, drainage, manures, orchards, mineral rights, sites for houses, sewage, cemeteries, and so on. The second part treats of the geological formations of England and Wales beginning with the recent (Quaternary) deposits and the succeeding chapters with formations going back through the geologic ages to the Archæan. In each case the chief characteristics of the formation are given, the localities where it is found are described and the uses and values of the areas for agriculture or for building sites are indicated. ROBERT M. BROWN.

The Conquest of Bread. By P. Kropotkin. xvi and 298 pp. Chapman & Hall, Ltd., London, 1913. 1s. 7 x 4½.

"In our civilized societies," writes Kropotkin, "we are rich. Why then are the many poor? Why this painful drudgery for the masses?"

In this book he answers these questions, and going further he outlines, carefully and in detail, the programme that would be followed by the Socialists if a Communist revolution were to take place in any nation or group of nations. He considers the various objections offered to the Communism which he upholds, and answers these objections from his own point of view.

WILBUR GREELEY BURROUGHS.

Unsere Kohlen. Von Paul Kukuk. Series: Aus Natur und Geisteswelt. ix and 120 pp. Map, ills., index. B. G. Teubner, Leipzig, 1913. Mk. 1.50. 7½ x 5.

This handy little volume is "an introduction to the geology of coal, includ-

ing its production, uses and economic importance,'' and can be said to contain everything which a person of general culture ought to know about this important mineral. It explains the formation of carboniferous rocks, the special chemical and physical properties of coal, coal mining, the uses of coal and its many by-products, and, what is of most importance to the geographer, it contains also a very exhaustive synopsis of the geographical distribution of coal fields in the various continents. An appendix gives a number of interesting statistics. Numerous illustrations, most of them made expressly for the book, a map of the coal fields of northwestern Europe, and an alphabetical index add to its usefulness. M. K. G.

METHODOLOGY AND TEACHING

Modern Geography for High Schools. By Rollin D. Salisbury, Harlan H. Barrows and Walter S. Tower. American Science Series. viii and 418 pp. Maps, ills., index. Henry Holt & Co., New York, 1913. 8 x 5½.

This, the second of the new type of High School Geographies to appear, is an abridgment of the ''Elements of Geography'' by the same authors. The two books are identical in plan and scope; there are the same number of chapters, the same chapter-titles and almost the same subdivisions of chapters. The High School book is made by omitting paragraphs, sections and illustrations from the earlier book. They are alike in devoting a large proportion of space to the atmosphere and climate. Climate is unquestionably a very important topic in geography, but it is questionable whether it deserves over one-fourth of the entire space. The absence of emphasis upon land forms marks a big change from the physical geographies of the last fifteen years.

The paragraphs are thoroughly boiled down; some will say too much so. There is an immense amount of material in the 400 pages. It is presented in clear and simple language, but it must be taken in smaller doses than the ordinary. Six of the twenty-one chapters are of the type commonly called humanized geography. They deal with those phases of the subject which have a more or less ''practical'' value—waterways, irrigation, reclamation, harbors, industries, resources, cities, and the like. Two of these chapters develop excellently the relationships between man and his geographical environment; they are the chapters on mountains, plateaus and plains. There are seven physical maps in colors at the end of the book; also a carefully selected list of reference books.

Like the earlier book, the later one will be welcomed as an added impulse to a movement in the right direction. Books of this type will give new life to a subject which, in a very large number of schools, has, of late, been on the defensive. R. H. WHITBECK.

Globes and Maps in Elementary Schools. A Teachers' Manual. By Leon O. Wiswell. 64 pp. Ills., index. Rand, McNally & Co., New York, 1913. 7½ x 5.

A small manual containing a series of elementary exercises in mathematical geography and designed to instruct pupils in the use of maps and the globe. There are globe exercises for grades 4, 5, 6, 7 and 8, and additional exercises suited to the lower classes in the secondary school. There is also a group of exercises dealing with the purpose, the reading, sketching and drawing of maps, and instructions on the care of maps. The manual closes with a suggested course of map lessons. It does not presuppose any expensive equipment; its use will aid in making clear the meaning of maps, and in teaching the fundamentals of mathematical geography. R. H. WHITBECK.

Notions Générales. L'Amérique, l'Océanie, l'Asie et l'Afrique. Première Année. Par F. Schrader et L. Gallouédec avec la collaboration de F. Maurette. viii and 445 pp. Maps, ills. Hachette et Cie., Paris, 1912. Fr. 3.50. 7½ x 5.

This book is designed for pupils in those normal schools of France which

prepare teachers for grade schools. This volume opens with the presentation of North and South America, Oceania, Asia and Africa. The treatment is threefold; first, a brief résumé of the facts which the teacher should know; second, descriptions with photographs of picturesque traits of physical and human geography for the purpose of exciting the imagination; third, explanations of the most characteristic, the most difficult or the most suggestive facts. The serious fault of the book lies in the first of these. The mere recital of facts apart from causes or effects cannot be countenanced as good pedagogy. The book would be more powerful and the pupils of the normal schools would probably be imbued with a greater array of facts if they were presented to them on some rational plan rather than as collections of data.

ROBERT M. BROWN.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

NORTH AMERICA

UNITED STATES

Massachusetts. Vegetation of Nantucket. [1:150,000]. 41°24′ - 41°14′ N.; 70°21′ - 69°57′ W. Accompanies, on p. 72, "The Vegetation of Nantucket" by J. W. Harshberger, *Bull. Geogr. Soc. Philadelphia,* Vol. 12, 1914, No. 2, pp. 70-79.

[Helpful phytogeographical map distinguishing between sand dune vegetation, heath, oak heath, salt marsh, marsh, deciduous woods, introduced pine, and farmland.]

SOUTH AMERICA

Argentina. Vegetationskarten aus dem Nordwesten Argentiniens (Calchaquitäler und Puna de Atacama). Entworfen und gezeichnet von Dr. Hans Seckt. 1:80,000. [Three maps (scale of all three given only on second):] I: Vegetationskarte des Tales von Cachi adentro (Calchaquitäler). [25° S. and 66⅓° W.]. Oriented N. 45° W. 14 colors. II: Vegetationskarte des Tales von Peñas Blancas (Calchaquitäler). [24¾° S. and 66¼° W.] 13 colors. III: Vegetationskarte der Quebrada de Azufre (Puna de Atacama). [24⅗° S. and 65⅝° W.]. Oriented N. 43° W. With inset: Übersichtskarte der Expedition. 1:3,500,000. 24° - 27° S.; 70¾° - 65⅓° W. 4 colors. Accompanies, as Taf. 17, "Vegetationsverhältnisse des nordwestlichen Teiles der Argentinischen Republik (Calchaquitäler und Puna de Atacama)" (first part) by H. Seckt, *Petermanns Mitt.*, Vol. 60, I, 1914, Feb., pp. 84-85.

[Detailed vegetational maps of the upper part of valleys heading in the eastern border of the Andean highland. Critical physical features and distribution of characteristic plants shown.]

AFRICA

French Sudan. Reconnaissance effectuée par le commandant J. Tilho dans les "Pays-Bas" du Tchad du 18 juin au 11 août 1913. 1:5,000,000. [19° - 13° N.; 14⅓° - 22⅓° E.] Accompanies, as Fig. 52 on p. 373, "Reconnaissance dans les 'Pays-Bas' du Tchad (18 juin-11 août 1913)" by J. Tilho, *La Géogr.*, Vol. 28, 1913, No. 6, pp. 372-374.

[Reconnaissance to the northeast of Lake Chad: distinguishes between desert, steppe, and cultivable area.]

ASIA

Celebes. Topographische Skizze aus dem Ostarm der Insel Celebes. Aufgenommen im Februar und März 1905 von Dr. J. Wanner. 1:250,000. 0°36′ - 1°31′ S.; 122°12′ - 123°3′ E. 4 colors. With inset showing extent of main

map: Das auf der Karte dargestellte Gebiet des Ostarms. [1:12,500,000]. Accompanies, as Taf. 16, ''Eine Reise durch Ostcelebes'' (first part) by J. Wanner, *Petermanns Mitt.*, Vol. 60, I, 1914, Feb., pp. 78-81.

[Valuable route survey: relief in contours (interval, 100 meters). Cf. also the maps of central Celebes listed under ''Celebes'' in the *Bull.*, Vol. 43, 1911, p. 549 (two items) and Vol. 45, 1912, p. 157.]

India. The Siachen or Rose Glacier and Tributaries in the Eastern Karakoram. Explored by the Fanny Bullock-Workman Expedition. 1912. 1:175,000. 35°44′ - 35°9′ N.; 76°33′ - 77°18′ E. 2 colors. With two insets: (1) Diagram of Triangulation of the Siachen Glacier. 1:500,000. (2) [Map of northern India showing location of main map]. 1:30,000,000. Accompanies ''The Exploration of the Siachen or Rose Glacier, Eastern Karakoram'' by F. B. Workman, *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 116-148.

[Important large-scale map of this longest (46 miles) glacier of the Karakoram Range, based on a trigonometrical plane table survey by C. Grant Peterkin. Snow-covered crests in bluish shading, exposed rock in hachuring and moraines in stippling in brown. A note on the map gives the sources used for the sections not surveyed by the expedition. Cf. Dr. Longstaff's map of the Eastern Karakorams under ''India'' in the *Bull.*, Vol. 42, 1910, p. 876; also other maps of the Karakorams under ''Himalaya,'' in Vol. 42, 1910, p. 399, and under ''India,'' Vol. 43, 1911, p. 957.]

India. (a) From Rawal Pindi to the Baltoro Glacier: Itinerary of the expedition of H. R. H. the Duke of the Abruzzi, from April to August 1909. 1:1,000,000. 36°16′ - 33°37′ N.; 73°0′ - 77°0′ E. 3 colors.

(b) Portion of the Karakoram Range (Western Himalaya). Drawn from the photogrammetric survey of the Expedition of H. R. H. the Duke of the Abruzzi, based upon the triangulation of the G. T. S. of India (N. W. Himalaya Series) and upon the Survey of Sir W. M. Conway, 1902. 1:100,000. 35°58′ - 35°34′ N.; 76°14′ - 76°44′ E. 4 colors.

(c) Portion of the Karakoram Range (Western Himalaya). Stations from which photogrammetric and ordinary panoramas and tacheometre and compass observations were taken for the survey of the district explored by H. R. H. the Duke of the Abruzzi. Same scale and coordinates as map (b). 4 colors.

Accompany, in separate pocket, ''Karakoram and Western Himalaya, 1909: An Account of the Expedition of H. R. H. Prince Luigi Amedeo of Savoy, Duke of the Abruzzi'' by F. De Filippi, London, 1912.

[Map (a) a general map showing the route of the expedition from the railroad to the Karakoram Range; relief in brown shading. Map (b) is the detailed survey by the expedition of the upper end of the Baltoro Glacier: snow-covered portions in approximate blue contours, exposed rock in hachures and moraines in stippling in brown. Map (c) is the same as map (b) with the addition, in red, of the sights taken from the various photogrammetric stations.]

Tibet. Capt. F. M. Bailey's Route to the Falls of the Tsang-po, 1913. 1:850,000. 30°5′ - 29°15′ N.; 94°48′ - 95°40′ E. With inset showing location of main map. Accompanies, on p. 185, ''Note on the Exploration of the Tsang-po'' by F. M. Bailey, *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 184-186.

Turkey in Asia. Esquisse de l'Yémen. Reconnaissances de Mr. A. Beneyton, Ingr. 1:2,000,000. 15°55′ - 12°50′ N.; 42°50′ - 45°7′ E. Accompanies, on p. 263, ''Mission d'études au Yémen'' by A. Beneyton, *La Géogr.*, Vol. 28, 1913, No. 4, pp. 201-219.

Turkey in Asia. Sketch Map showing Railway Surveys in Yemen. 1:2,000,000. 15⅘° - 12⅖° N.; 42⅝° - 45⅛° E. Accompanies, facing p. 66, ''Railway Surveys in Yemen,'' *Geogr. Journ.*, Vol. 43, 1914, No. 1, pp. 66-68.

[North of 13½° N. this map is based on the map in *La Géographie* listed immediately above; south of that latitude, on the map of Arabia and the Persian Gulf, 1908, by Capt. F. F. Hunter of the Survey of India. Relief in hachures.]

Turkey in Asia. Reise von Mossul nach Wan (Zentralkurdistan). Nach Originalaufnahmen von Dr. Bachmann 1911. 1:200,000. 3 colors. [Three sheets:] (1) Blatt I: Von Mossul bis Amadia. 37°6′ - 36°19′ N.; 43°0′ - 43°40′ E. (2) Blatt II: Von Amadia bis zum Harefta Dagh. 37°48′ - 37°4′ N.; 43°15′ - 44°0′ E. (3) Blatt III: Vom Harefta Dagh bis Wan. 38°34′ - 37°45′ N.; 43°15′ - 44°15′ E. With inset: Übersicht zu Dr. W. Bachmanns Reisen in Zentralkurdistan (Mossul-Wan). 1:2,000,000. 39⅓° - 35½° N.; 41½° - 46° E. 2 colors. Accompany, as Taf. 1, 2 and 3, "Bericht zur Routenkarte von Mossul nach Wan" by W. Bachmann, *Petermanns Mitt.*, Vol. 60, I, 1914, Jan., pp. 21-25.

[Valuable survey of more direct although less frequented route between Mosul and Van than the usual one via the upper Tigris and Bitlis. Relief in brown contour-shading, drainage in blue, cultivated areas in green, author's route in red.]

EUROPE

Belgium. (a) Carte linguistique des environs de Bruxelles, d'après le recensement de 1900. 1:200,000. 50°54′ - 50°41′ N.; 4°12′ - 4°31′ E.

(b) Carte linguistique des environs de Bruxelles, d'après le recensement de 1910. Same scale and coordinates as map (a).

Accompany, as Figs. 48 and 49 on pp. 310 and 312 respectively, "Les progrès du Français dans l'agglomération bruxelloise" by P. Reclus, *La Géogr.*, Vol. 28, 1913, No. 5, pp. 308-318.

England. (a) The Southern Pennines. [1:2,000,000]. [54°25′ - 52°30′ N.; 3°20′ W. - 0°30′ E.]. [Five maps:] (1) Census Districts and Towns. (2) Density of the Population in 1801. (3) Density of the Population in 1851. (4) Density of the Population in 1901. (5) Changes in the Population during the Nineteenth Century.

(b) Nottinghamshire. [Five maps, the first four, 1:500,000, the last, 1:750,000]. [53°30′ - 52°45′ N.; 1°20′ - 0°37′ W.]. (1) Density of the Population in 1801. (2) Density of the Population in 1851. (3) Density of the Population in 1901. (4) Changes in the Population during the Nineteenth Century. (5) Summary of Population Changes during the Nineteenth Century.

(c) Nottinghamshire Collieries. [1:800,000]. [52°52′ - 53°25′ N.; 1°20′ - 1°0′ W.]. [Seven maps:] (1) 1811. (2) 1854. (3) 1861. (4) 1871. (5) 1881. (6) 1891. (7) 1901.

(d) Nottinghamshire Railways during the Nineteenth Century. [1:1,600,-000]. Coordinates as under (b). [Seven maps:] (1) 1842. (2) 1851. (3) 1861. (4) 1871. (5) 1881. (6) 1891. (7) 1901.

Accompany: maps under (a), as Figs. 1, 2, 3, 4 and 5 on pp. 35, 36, 37, 38 and 40, respectively; maps under (b), as Figs. 6, 7, 8, 9 and 10, on pp. 42, 43, 44, 46, and 47, respectively; maps under (c) as Fig. 12 on p. 51; and maps under (d) as Fig. 15 on p. 55, "Nottinghamshire in the Nineteenth Century: The Geographical Factors in the Growth of the Population" by B. C. Wallis, *Geogr. Journ.*, Vol. 43, 1914, No. 1, pp. 34-61.

[Black-and-white sketch maps illustrating a detailed study of Nottinghamshire. The symbols to show gradation have not been very felicitously chosen for Figs. 4, 7 and 8, where the same series of symbols is used for the higher density grades as for the lower, except for a heavy black bordering line. Thus, except for this differentiation, the densities 0-128 and 1153-1280 both appear white, necessitating a mental adjustment to the legend in order to avoid misconceptions. To be sure, the great number of symbols required (maximum of 18 on Fig. 4) presents a formidable problem when restricted to representation in black-and-white only.]

Germany. Schnellzugskarte des Deutschen Reiches. Entworfen von Reg.-Ass. H. v. Hedemann. Mean scale 1:2,200,000. [55½° - 46½° N.; 4° - 23° E.]. 1 color. Accompanies, as Taf. 9, "Schnellzugskarte des Deutschen Reiches" by H. v. Hedemann, *Petermanns Mitt.*, Vol. 60, I, 1914, Jan., p. 30.

[Diagrammatic map showing, by the number of lines, the number of express trains running in one direction on the main railroads of Germany.]

Italy. Morphologische Karte des Monte Argentario (Toskana). Auf Grund italienischer Karten und eigener Beobachtungen gezeichnet von G. Braun, 1913. 1:1,000,000. 42°30.5′ - 42°20.0′ N.; 1°25′ - 1°0′ W. 6 colors. Accompanies, as Taf. 8, "Der Monte Argentario in Toskana" by G. Braun, *Petermanns Mitt.*, Vol. 60, I, 1914, Jan., pp. 17-20.

[Example of an island tied to the mainland by two tombolos.]

POLAR

Antarctic. Sketch Map to illustrate the paper by Raymond E. Priestley on the Work of the Northern Party, British Antarctic Expedition, 1910-13. [Two maps:] (1) [Robertson Bay]. 1:500,000. [71½° S. and 170° E.]. (2) [Vicinity of Terra Nova Bay]. 1:500,000. [74½° S. and 164° E.]. With inset showing extent of main maps: [South Victoria Land]. 1:5,000,000. 70° - 78° S.; 160° - 180° E. Accompany "Work and Adventures of the Northern Party of Captain Scott's Antarctic Expedition, 1910-1913" by R. E. Priestley, *Geogr. Journ.*, Vol. 43, 1914, No. 1, pp. 1-16.

Antarctic. South Polar Regions showing the proposed routes of the Trans-Antarctic Expedition, 1914. 1:60,000,000. Polar cap within about 50° S. Accompanies, on p. 175, "The Imperial Trans-Antarctic Expedition, 1914" by E. Shackleton, *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 173-178.

WORLD AND LARGER PARTS

World. Die Verbreitung der Wildschafe. Entworfen von Dr. Rud. Kowarzik. [Asia]. 1:20,000,000. 80° - 22° N.; 20° - 180° E. 2 colors. With four insets: (1) [Sardinia and Corsica]. 1:3,700,000. 43° - 38¾° N.; 8° - 10° E. 2 colors. (2) Vorderasien. 1:15,000,000. 43° - 34° N.; 30° - 50° E. 2 colors. (3) Alaska. 1:25,000,000. 71° - 53° N.; 175° - 120° W. 2 colors. (1) Westl. Nordamerika. 1:25,000,000. 57° - 23° N.; 130° - 94° W. 2 colors. Accompanies, as Taf. 15, "Die Verbreitung der Wildschafe: Ein interessantes Kapitel moderner Tiergeographie" by R. Kowarzik, *Petermanns Mitt.*, Vol. 60, I, 1914, Feb., pp. 70-72.

[Suggestive map showing the distribution of wild sheep and supporting Matschie's hypothesis that drainage divides constitute the limits of each species.]

World. Sketch Maps to illustrate the paper by Prof. J. W. Gregory, D.Sc., F.R.S., entitled "Is the Earth Drying Up?" [Three maps:] Map I: Annual Isotherms (Fahrenheit), Mediterranean Region. 1:40,000,000. 60° - 27° N.; 20° W. - 60° E. Map II: Map illustrating the Southern Position of the low pressure track in Glacial Times. Central scale 1:80,000,000. 90° - 100° N.; 110° W. - 70° E. Map III: Map illustrative of the Question of the change in Precipitation. [Mercator's projection, equatorial scale 1:180,000,000]. Zone between 79° N. and 60° S. Accompany "Is the Earth Drying Up?" (first part) by J. W. Gregory, *Geogr. Journ.*, Vol. 43, 1914, No. 2, pp. 148-172.

[Map II illustrates, after Köppen, the probable diversion to the south of the chief routes of the low pressure areas during the Glacial Period. Map II distinguishes between localities where there is evidence of no change or of more humid or drier climatic conditions in historic time.]

Other Maps Received

NORTH AMERICA

United States. Outline Map of the United States by Counties. [1:5,800,000]. [Three editions: (1) without county names; with county names in (2) pale blue and (3) black.]. U. S. Department of Agriculture, Washington, 1910.

AFRICA

Africa. Carte d'Afrique, par F. Schrader, F. Prudent, E. Anthoine, Dressée par M. Chesneau. 1:15,000,000. [From: Atlas de Géographie Moderne]. Librairie Hachette & Cie., Paris, 1913.

Portuguese West Africa. Africa Occidental Portugueza; Esboço chorographico da Provincia d'Angola. 1:1,000,000. Folha no. 7, Benguella; no. 8, Huilla, 1906; no. 11, Bihé e Moxico; no. 15, Moxico. Ministerio da Marinha Ultramar, Commissão de Cartographia, Lisboa, 1905.

ASIA

China. A map of China, prepared for the Chinese Inland Mission. 1:3,000,000. Chinese Inland Mission, London, 1913.

India. Geological map of India and adjacent countries. 1:2,027,520. Geological Survey of India. Calcutta, 1909.

The Karakoram Himalayas. Sheet I, Bagrot, Hunza, Nagyr & the Hispar Glacier; II, The Biafo & Baltoro Glaciers. 1:126,720. The Royal Geographical Society, London, 1894.

Mongolia. Map of Mongolia. 200 versts to the inch (1:8,400,000). Ilyin's Cartographical Establishment, St. Petersburg (1912). 20 kopeks. [In Russian].

Tibet. Tibet and the surrounding regions. 1:3,800,000. Royal Geographical Society, London, 1906.

AUSTRALASIA AND OCEANIA

Western Australia. Geological sketch map of Western Australia. 100 mi. to 1 in. Geological Survey of Western Australia, Perth.

Geological Map of Kalgoorlie. 10 chains to 1 inch. Geological Survey of Western Australia, Perth, 1902.

Geological Map of Northampton by A. Gibb Maitland. 20 chains to 1 inch. Department of Mines, Perth, 1898.

Mining map of the Boulder Belt, East Coolgardie, G. F. 4 chains to 1 inch. Geological Survey of Western Australia, Perth, 1900.

EUROPE

Austria-Hungary. Freytags Eisenbahn-Wandkarte von Österreich-Ungarn. 1:750,000. Insets: Umgebung von Wien, 1:250,000; Umgebung von Budapest, 1:125,000; Umgebung von Prag, 1:200,000; Norwest-Böhmen, 1:300,000; Verkehrskarte der Balkanhalbinsel, 1:1,500,000. Freytag & Berndt, Wien.

G. Freytags Verkehrskarte von Österreich-Ungarn. 1:1,400,000. Freytag u. Berndt, Wien, 1914.

G. Freytags Karte der Umgebung von Bozen, 1:150,000, mit den Stadtplänen von Bozen-Gries, 1:12,000, und Meran, Ober- und Untermais, 1:12,000. Freytag & Berndt, Wien. 60 Heller.

Freytags Skirouten-Karte [a] des Berchtesgadnerlandes und Pinzgaues, [b] des Grazer Bergland, [c] des Östlichen Salzkammergutes, [d] des Ennstales und der Rottenmanner Tauern, [e] der Niederösterr.-Steirischen Kalkalpen (Westliches Blatt), [f] der Niederöst.-Steir. Kalkalpen (Östlicher Teil), [g] des Unteren Mürztales und des Hochschwabgebietes. 1:100,000. Freytag & Berndt, Wien. Kr. 2 each.

Karte der Lechtaler-Alpen, Arlberg-Gebiet. 1:25,000. Freytag & Berndt, Wien, 1913.

Strassen-Karte des Erzherzogthumes Österreich unter der Enns. 1:75,000. Verlag von R. Lechner, k. u. k. Hof- und Univ.-Buchhandlung, Wien, 1903.

Handkarte des politischen Bezirkes Baden. 1:150,000. Freytag & Berndt, Wien.

Karte des politischen Bezirkes Floridsdorf-Umgebung. 1:200,000. Freytag & Berndt, Wien, 1910.

Karte des politischen Bezirkes Gänserndorf. 1:200,000. Freytag & Berndt, Wien.

Karte des Bezirkes Krumman. 1:150,000. Anstalt G. Freytag & Berndt, Wien. Heller 30.

Historisch-Geogr. Plan der Stadt Marburg a. d. Drau. von Dr. M. Hoffer. 1:10,000. Freytag & Berndt, Wien, 1913.

Kunsthistorischer Plan des I. Bezirkes der k. k. Reichshaupt- und Residenzstadt Wien. Aufgenommen von Prof. Dr. H. Hassinger. 1:10,000. Freytag & Berndt, Wien, 1912. 60 Heller.

Austria-Hungary—Balkan States. Neue Bahnprojekte in Österreich-Ungarn und den Balkanstaaten, bearbeitet von G. Freytag. 1:1,500,000. Freytag & Berndt, Wien, 1914. K. 2.

Balkan States. G. Freytags Karte der Balkan-Halbinsel. 1:1,250,000. Freytag & Berndt, Wien. K. 1.20.

I paesi balcanici, la Grecia ed i limiti dell' Impero Ottomano in Europa. 1:2,000,000. G. B. Paravia & Co., Torino, 1914.

Die zentralen Balkanländer zwischen Adria u. Pontus. Auf Grundlage der II. Ausgabe von Scheda's Balkankarte. Bearbeitet von Dr. Karl Peucker. 1:864,000. V. Auflage 1914. Artaria & Co., Wien, 1914.

Karte des Fürstentums Albanien. 1:600,000. Freytag & Berndt, Wien. Kr. 1.

British Isles. Bartholomew's "Half-inch to mile" map of England and Wales. Sheet 3, Cumberland, the Lake District. 2 mi. to 1 in. Edinburgh, John Bartholomew, [1913]. 2 shillings.

Denmark. Borris Sönderland Specialkort i 1:20,000. Generalstaben, Kjöbenhavn, 1907.

Germany. Karte vom Schwarzwald. 1:400,000. Otto Weber, Heilbronn, 1914.

(1) Jever. (Gradabtheilung 142, Blatt 1017). Geognost. und agronom. bearbeitet. 1:25,000. (2) Agronomische Bohrungen zu Blatt Jever. With accompanying text. 140 pp. Oldenburgische Landwirtschafts-Gesellschaft, Oldenburg, 1898.

Italy. Carta amministrativa stradale della Provincia di Alessandria. 1:250,000. Novara, Istituto Geografico de Agostini. [1913]. Lire 0.60.

Switzerland. Uebersichtskarte der Schweiz mit ihren Grenzgebieten. 1:1,000,000. Eidg. topogr. Bureau, Bern, 1912.

Carte officielle des postes suisses avec indication des bureaux de télégraphe et des chemins de fer. 1:250,000. Direction Générale des Postes Suisses, Berne, 1912.

WORLD AND LARGER PARTS

World. Official wireless map of the world, compiled by Marconi's Wireless Telegraph Co. [Mercator's projection: equatorial scale, 1:48,300,000.] Geo. Philip & Son, Ltd., London, 1913. 2/6.

World. The Navy League Map, illustrating British Naval History. [Mercator's projection: equatorial scale, 1:22,600,000.] W. & A. K. Johnston, Edinburgh, 1913.

EDUCATIONAL

Austria. Schulwandkarte des politischen Bezirkes Feldbach. 1:50,000. Freytag & Berndt, Wien, 1913.

Schulwandkarte des politischen Bezirkes Baden. 1:25,000. Freytag & Berndt, Wien, 1911. Kr. 36.

Schulwandkarte des Erzherzogtums Österreich unter der Enns, bearbeitet von J. G. Rothaug und Dr. F. Umlauft. 1:150,000. Freytag & Berndt, Wien.

Schulhandkarte der Bezirkshauptmannschaft Liesen, . . . von L. Comai . . . und A. Bischofberger . . . 1:200,000. G. Freytag & Berndt, Wien. 32 Heller.

The Netherlands. Twaalf Wandkarten der Vaterlandsche Geschiedenis door J. W. de Jongh: No. 1, Nederland vóór ten tijde der Romeinen; 2, Nederland omstreeks 1300; 3, 1543; Karel V. heer over de zeventien nederlandische gewesten; 4, De tachtigjarige oorlog; 5, Beleg en ontzet van Leiden in 1574; 6, De overzeesche bezittingen der republiek in de 17e eeuw; 7, De gevestigde republiek der Vereenigde Nederlanden, 1648; 8, Het jaar 1672. Inset: De hollandsche waterlinie; 9, Middel-Europa in de eeuw van Lodewijk XIV; 10, (a) De Bataafsche Republiek van 1798 tot 1801, (b) Het bataafsch gemeenebest van 1801 tot 1806, (c) Het Koninkrijk Holland van 1806 tot 1810, (d) Holland, een fransch wingewest van 1810 tot 1813; 11, Het Koninkrijk der Nederlande van 1814 tot 1839; 12, Groei en bloei van onze Oost-Indische Bezittingen. With accompanying text: Toelichting bij de twaalf historische wand-kaarten der vaderlandsche geschiedenis met gekleurde photo-lithographische reproducties en eenige illustraties, door J. W. de Jongh. Joh. Ykema, 's-Gravenhage, 1909.

ATLASES

Vaterländischer Geographischer Schulatlas auf heimatlicher Grundlage in Karten und Bildern, bearbeitet von Joh. G. Rothaug. Ausgabe für Böhmen, Preis K. 1.60; Ausgabe für Niederösterreich, Preis K. 2.20; Ausgabe für Schlesien, Preis K. 3. Freytag u. Berndt, Wien, 1912. K. 1.60.

Prof. H. L. Hickmanns Geographisch-Statisticher Universal Taschen-Atlas. G. Freytag & Berndt, Wien, 1914.

Erratum

Central America. Referring to the last sentence of the review of his maps of volcanic regions of Central America in the January *Bulletin* (Vol. 46, 1914), pp. 75-76, Professor Sapper kindly informs us that he had desired that a large-scale general map showing the relationship of the various groups of volcanoes to each other accompany his monograph, but that the editor had not been able to accede to this request inasmuch as maps of this nature had already appeared in previous numbers of the *Ergänzungshefte* and of *Petermanns Mitteilungen*, as follows:

(1) (a) Originalkarte [hypsometric] des nördlichen Mittel-Amerika. Nach eigenen Aufnahmen und allen vorhandenen Quellen entworfen und gezeichnet von Dr. Carl Sapper. 1:1,100,000. 22°20′ - 12°55′ N.; 93°50′ - 86°15′ W. 12 colors. In 2 sheets.

(b) Geologische Karte des nördlichen Mittel-Amerikas. Nach eigenen Aufnahmen und allen vorhandenen Quellen entworfen und gezeichnet von Dr. Carl Sapper. Same scale and coordinates as map (a). 28 colors. In 2 sheets.

Accompany, as Taf. I and II, "Über Gebirgsbau und Boden des nördlichen Mittelamerika" by C. Sapper, *Ergänzungsheft zu Petermanns Mitt. Nr. 127*, 1899.

(2) Geologische Karte des südlichen Mittelamerika von Dr. Karl Sapper. 1:1,750,000. 13°25′ - 7°10′ N.; 87°50′ - 79°30′ W. 19 colors. With inset: Skizze einer Bodenkarte des südlichen Mittelamerika. Von Dr. Karl Sapper, 1903. 1:40,000,000. 16°20′ - 8°0′ N.; 89°20′ - 81°10′ W. 11 colors. Accompanies, as Taf. I, "Über Gebirgsbau und Boden des südlichen Mittelamerika," by K. Sapper, *Ergänzungsheft zu Petermanns Mitt. Nr. 151*, 1905.

(3) Entwurf von Höhenschichtlinien der mittleren Vulkanregion Nicaraguas. 1:300,000. Accompanies, as Taf. 50, paper with same title by same author, *Petermanns Mitt.*, Vol. 59, I, 1913, pp. 310-311.

The *Bulletin* takes pleasure in calling attention *nominatim* to these fundamental maps of Central America. The last was listed in detail, with comment, under Nicaragua in the *Bull.*, Vol. 45, 1913, pp. 716-117.

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THE GENERAL MAGNETIC SURVEY OF THE EARTH*

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The famous mathematical physicist Stokes is said to have remarked that we must not forget that the chief instrument of investigation, the mind, is itself the object of research. Possibly no one means or instrumentality has contributed more powerfully to discoveries and research in the science represented by this joint gathering tonight—geography—than the magnetic compass. You have accorded me the privilege of showing briefly this evening how this instrument of investigation has itself been made the object of a research not only coextensive with the boundaries of the planet we inhabit but even transcending them. We shall find, as we pursue our studies of that mysterious force called the earth's magnetism, that we are, indeed, limited by no well-defined boundary as, for example, the earth's surface, but are carried far out into limitless space and even to the sun itself.

Professor J. A. Fleming closed his suggestive popular address before the British Association for the Advancement of Science, at Liverpool in 1896, on "The Earth, A Great Magnet," as follows:

> "To us as a maritime nation, to you who are inhabitants of a maritime city, the progress of a knowledge of terrestrial magnetism, the improvements in the compass, the study of the causes of error in iron ships, in short, everything connected with the use and evolution of the compass, is of unspeakable importance. * * *
>
> "That great empire which has its center in these islands, but its dominions

* The evening lecture given before the first joint meeting of the American Geographical Society and the Association of American Geographers in New York, April 3, 1914; illustrated by lantern slides.

scattered over distant seas, has been built up primarily on the art of navigation, in which the magnetism of the earth is a central fact. Neither its world-wide commerce, nor the naval power which defends its coasts, could exist for a day without the aid of the magnetic compass. But our globe, as it spins through space, is clothed, as it were, in a gossamer garment woven of lines of magnetic force, and this little trembling needle serves as a sensitive finger, whereby we track out the path of these invisible clues, and, confidently determining our direction, though wandering over wide waters, wrapped, it may be, in darkness or in storm, are enabled thereby to establish a continual intercourse between all portions of the habitable globe.''

The Earth's Lines of Magnetic Force

Gilbert in 1600 had already spoken of the rays of magnetic force emanating in all directions from the lodestone's center, and thus forming an ''orb'' or ''sphere of influence'' around ''that great magnet, the earth.'' ''Like as the tender mother draws the suckling babe to her breast,'' runs a Chinese saying, ''so does the stone draw unto itself the all-conquering iron.'' No wonder then that the lodestone has also been called the lovestone; indeed the French still call the magnet ''l'aimant.'' And its mysterious sphere of influence—Gilbert's ''orbis virtutis,'' Fleming's ''gossamer garment, woven of lines of magnetic force,'' surrounding and extending far beyond the visual boundary of the lodestone, endowed the latter, from the earliest times, with many peculiar properties and gave rise to many queer superstitious notions.

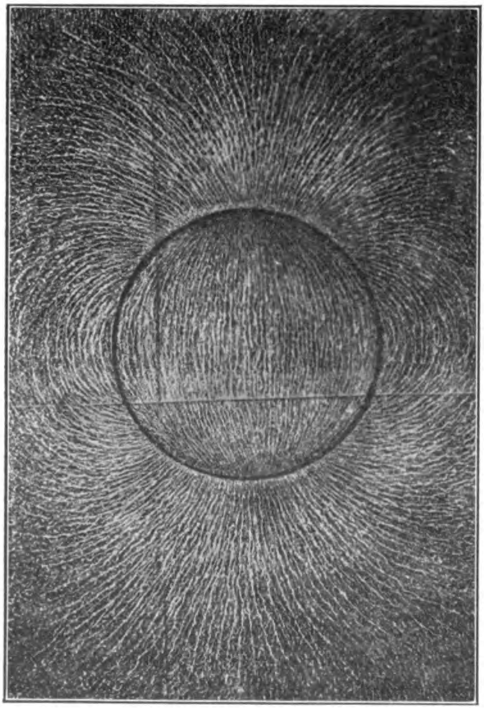

Fig. 1—Lines of force of a uniformly magnetized sphere. [The earth's magnetic field is not of this simple character; its magnetic poles are, on the average, 1,200 miles distant from its geographic poles and they are not diametrically opposite each other. A straight line connecting the earth's magnetic poles would pass through the earth 750 miles off from the center.]

The term "lines of magnetic force" for the paths traced out by the iron filings strewn around a magnetized body, we owe to Michael Faraday. The many brilliant and fruitful researches in magnetism and electricity by this indefatigable worker during the first half of the last century were in no small measure inspired by this happy conception of a "field" and "lines of force" about a magnet.

Picture then to yourselves these lines of magnetic force (Fig. 1) starting out from the earth's south magnetic pole and, after sweeping far out into space, curving gracefully around high above our equator and reentering finally at the north magnetic pole. Recall now that, while these lines cannot ordinarily be seen, they are made apparent to us by the beautiful phenomenon of polar lights, whose flickering flames and shooting rays arrange themselves in accordance with the earth's lines of magnetic force, and "dance in rhythm with the quivering needle." What is the origin of these lights? According to the latest theories, it is believed that when the tiny electrically-charged particles, continually being given off by our sun, come within reach of these lines of force, they are made to wrap themselves around them, descending into the polar regions along a spiral staircase, as it were. Before reaching the earth's surface, however, at heights of about twenty-five to three hundred miles, they are brought into luminescence, and thus we have the aurora borealis in the arctic regions and the aurora australis in the antarctic.

Who knows what part the earth's lines of magnetic force may not play, in the economy of nature, by carrying away and thus preventing an over-charge of electrified particles, shot off by the sun, from penetrating so low down towards the earth's surface as to be, perhaps, not wholly beneficial to man's physical well-being? Thus the earth's magnetic atmosphere, or aura, so to speak, may perform a screening function, with respect to these electrified particles, similar to that of the atmospheric envelope which comes within the ken of the meteorologist, in warding off the meteoric projectiles forever being hurled at us by our celestial neighbors.

We were then right when we surmised that our studies of the earth's magnetism, or what is the same thing, of the earth's surrounding magnetic field as traced out by its lines of magnetic force, carry us "far out into limitless space and even to the sun itself." And as we progress in our subject let us ever keep before us Professor Fleming's beautiful imagery: "The earth spinning through space, clothed as it were, in a gossamer garment, woven of lines of magnetic force." We shall find that the earth is not alone in this respect.

Our duty, at present, then, is to map completely, over the earth's immediate surface, its lines of magnetic force, though later we may attempt to do the same in ocean depths and atmospheric heights. We must ascertain, at each place of observation, whether the vertical plane passing through any given line of force coincides with a meridional plane of the earth and, if not, what the angle of divergence is; or, in other words, we must measure the angle which the direction pointed out by a compass needle makes with a true north and south line. This angle is reckoned as so many degrees east or west of north and is known to the mariner and surveyor as the "variation of the compass," and to the man of science, who finds need for more precise terms, as the magnetic declination. In the United States, for example, the magnetic declination varies at present from 22° West, in Maine, to 23° East, in Oregon.

But we also must know the steepness of the lines of force, that is, the angle at which they enter or emerge from the earth. This angle is measured with the aid of the well-known instrument, the dip-circle. The angle which the dipping needle makes with the horizon, if the vertical plane of the dip-circle passes through the magnetic meridian, *i.e.*, the direction defined by the compass-needle, is called the magnetic inclination or dip. At the north magnetic pole, the dip-needle stands vertical with the north end down, whereas at the south magnetic pole, the south end is down. Half way between, at the so-called magnetic equator, a dip-needle sets itself with neither end up or down but, instead, lies truly horizontal.

Knowing both the magnetic declination and the magnetic inclination, we are able to map out completely the direction everywhere assumed by the earth's lines of magnetic force. But this is not sufficient either for theory or for the practical application of the earth's magnetic phenomena to the everyday affairs of man. Thus, in order to correct properly a compass on a modern ironclad, or in other words, in order to counteract effectively on the compass the disturbing influence of the ship's own magnetism, due to the iron and steel entering into her construction, we must know, in all the oceans traversed, how strong or weak is the force exerted by our earth-magnet. Hence, our third and final element of observation is the so-called "intensity of the earth's magnetic field."

The Earliest Observations and The Earth's Changing Magnetism

It was a discovery respecting the direction assumed by the compass-needle which gave definition to the first boundary line of

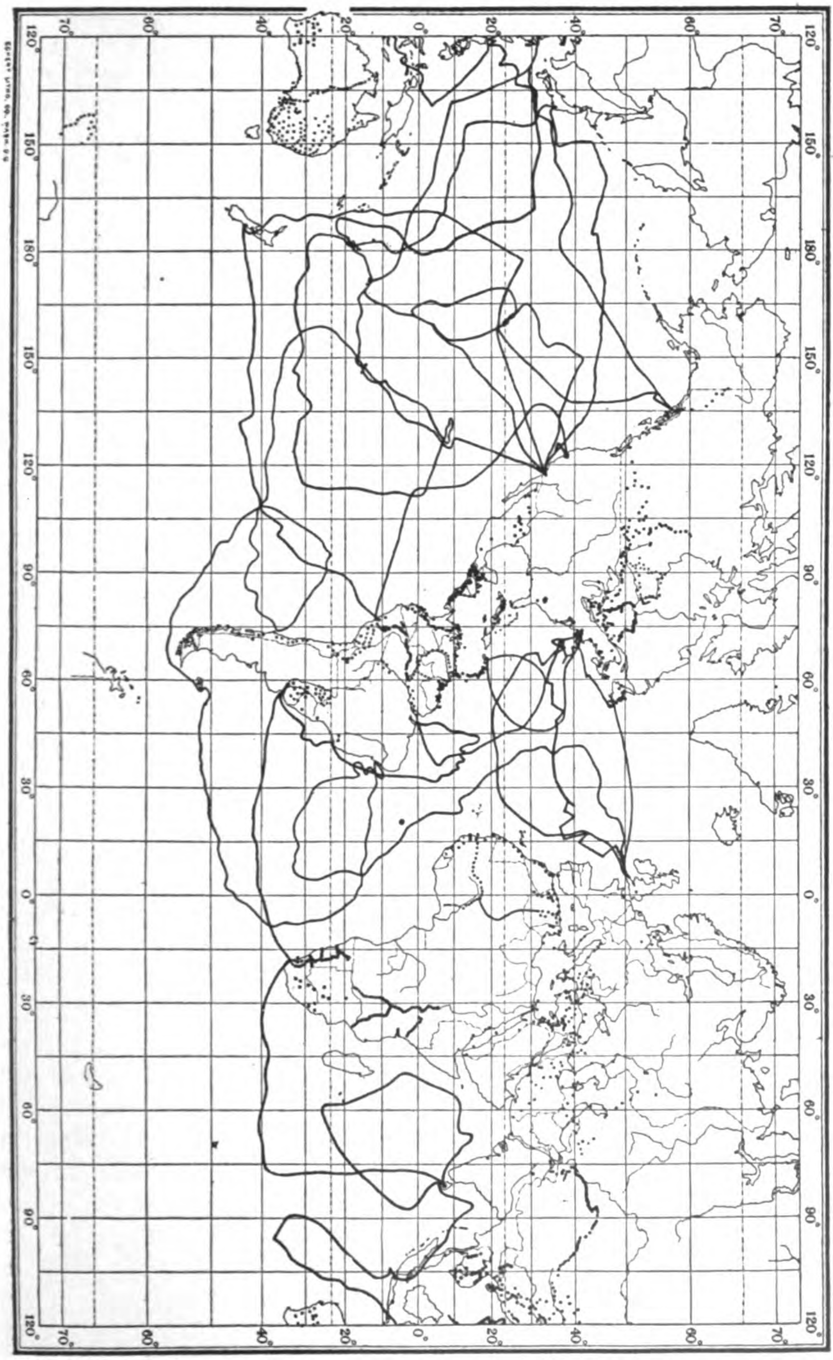

Fig. 2—Status of the field operations of the Department of Terrestrial Magnetism, 1905-1918.

great political importance. On September 13, 1492, during that memorable first voyage of Columbus, when they were off one of the islands of the Canaries, the compass, to the great consternation of the sailors, was found to point west of the polar star. From the time of embarking from the Spanish coast, the compass had been pointing east of that star, hence east of true north. To quiet the superstitious sailors, it is said that the doughty admiral shifted the compass card with respect to the needle so that the compass bore true again and he thus led them to believe that it was the star that varied its position and not the compass its direction. The fact is that during this voyage they crossed, in the meridian somewhat west

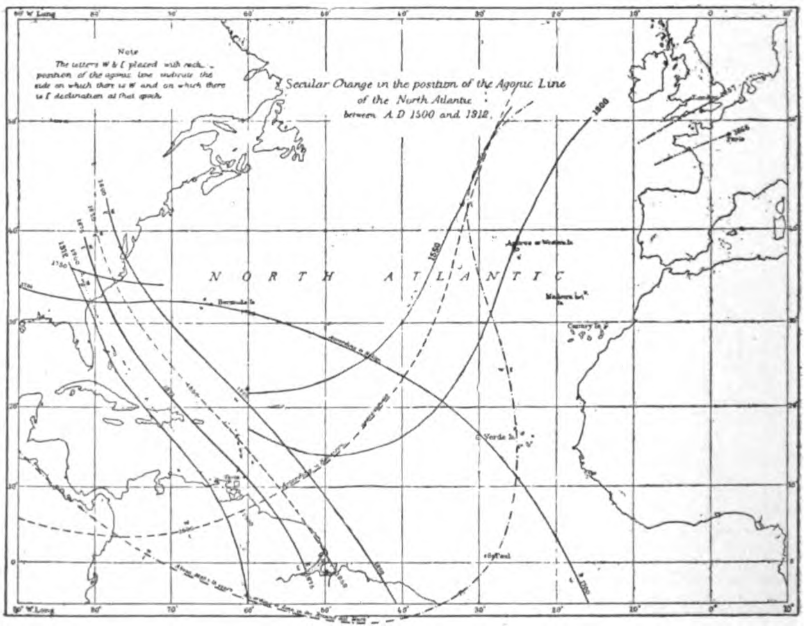

Fig. 3—Secular change in the position of the agonic line of the North Atlantic between A.D. 1500 and 1912. Chiefly after C. A. Schott and W. van Bemmelen.

of Fayal, one of the Azores, the agonic line, or line of no magnetic declination or variation of the compass, along which the magnetic needle sets itself exactly north and south (Fig. 3). At Palos, the port from which Columbus sailed, the magnetic declination was about half a point east and diminished to zero when the agonic line was crossed. Then the compass pointed to the west of north by an ever-increasing amount until in about mid-ocean the bearing was as much as a point. From that time, it diminished and when at last land was reached, the compass-bearing was about half a point west.

This line along which the needle pointed exactly north and south, in the time of Columbus and Cabot, was believed to be a convenient line, "given by nature herself" from which to reckon longitude and it figured prominently in history for many years as the line of demarcation between the rival kingdoms of Portugal and Castile. Alas, however, for human invention, it was soon found that this line, far from being straight, is very devious, indeed, and, what is worse, it is not even fixed in position, having now disappeared almost entirely in the North Atlantic Ocean, though it may come back again in the distant future.

Just who first discovered that a compass, except at few places, does not point true north and south, can not be definitely ascertained. It would appear from some early sun-dials, that this fact may have been discovered before, or at least independently of, the voyage of Columbus. However, it can not be denied that it was his voyage which first definitely showed that the compass, contrary to the poet's line—"True as the needle to the pole,"—usually does not point to the true north but that the amount of divergence varies from locality to locality. The necessity in navigation for measuring the angle by which the north end of the compass points east or west of north, thus became definitely apparent in 1492, and hence this must be regarded as the year of the birth of the science of terrestrial magnetism, which has for its primary object the measurement of the earth's magnetic elements, *i.e.*, the making of so-called magnetic surveys.

Probably the first systematic magnetic survey, though it was but a partial one in that it concerned itself with only one element, the magnetic declination, was that under the leadership of the famous English astronomer, Edmund Halley, known to most of us as the discoverer of Halley's comet which reappeared a few years ago. Under orders from the British Government, between 1698 and 1700, Halley cruised up and down the Atlantic in command of the sailing ship, the *Paramour Pink,* and diligently observed the "variation of the compass" and "the true situation both of longitude and latitude of the ports" he visited. He laid down the result of his labors on a chart, sometimes briefly called the "Tabula Nautica," which was the first of its kind. Quoting Halley: "What is here properly *New* is the *Curve Lines* drawn over the several Seas, to show the degrees of the *Variation* of the *Magnetical Needle,* or *Sea-Compass.*"

Halley's chart and its successors soon won among mariners well-deserved popularity, but by about the middle of the eighteenth

century, or fifty years after the first issue, in 1701, the "Curve Lines" were found to have changed so much as to require their complete reconstruction. For "the magnetic state of our globe is one of swift and ceaseless change and but a few years suffice to alter it materially."

This "swift and ceaseless" change in the earth's magnetic state was strikingly made evident when, in the fall of 1909, there set out from the shores of Newfoundland another sailing vessel, of which we shall have more to tell later. Beset by October gales she, nevertheless, unerringly followed, all the way to England, very nearly the identical track pursued by Halley's vessel 210 years before, and like Halley's vessel was also bent on measuring the "variation of the compass." Such great changes were found that, if the latter had attempted to follow the same magnetic courses as those of the *Paramour Pink*, instead of coming to anchor in the quaint, old harbor of Falmouth, her landfall would have been somewhere on the northwest coast of Scotland.

Magnetic Survey of the Oceans

Though many noteworthy expeditions could be mentioned which, in the interim between Halley's and those of the Carnegie Institution of Washington, obtained credible magnetic data incidental to other work or objects, and while also naval vessels of various nations have contributed, from time to time, useful information, during all these two hundred years no vessel had been sent out by any country for the sole purpose of making magnetic observations. Thanks to the munificence of one, well-known to all of you, it became possible, on April 1, 1904, just ten years ago, for the Trustees of the Carnegie Institution of Washington to establish a department which could undertake as its chief task a systematic magnetic survey not only of the oceans, but of the whole earth, on a scale and with a dispatch not heretofore possible.

After some preliminary investigations, it became evident that the first ocean magnetic survey to be undertaken was that of the Pacific, for it was in this region that the Halleyan "Curve Lines" on which mariners depended, were known, because of the paucity of data, to be more or less uncertain. New instruments had to be in part devised, for our survey was to be far more comprehensive than Halley's could be and was to embrace all the necessary observations for completely defining the direction and intensity of the earth's magnetic force at sea. Time will not permit us to enter into details; suffice it to say that we were ready to embark on our first voyage

in July, 1905, from San Francisco, in a chartered vessel, the *Galilee,* which we had been able to make approximately non-magnetic. During the three years (1905-1908) that the vessel was in commission, her cruises aggregated in length 60,000 miles and extended from Sitka, Alaska, in the north, to Port Lyttelton, New Zealand, in the south.

The *Galilee,* with the changes made, proved to be more non-magnetic than any modern vessel on which magnetic observations had been attempted. It was found that, with our appliances and methods, the results were of such accuracy as to warrant applying the corrections due to the remaining iron in the *Galilee* which, without reconstructing the vessel, could not readily be replaced by non-magnetic metal. These so-called deviation-corrections, though small, were yet, if they were not known, large enough to defeat our purpose to determine the amount of change in the magnetic elements by repeating the observations at the intersections of our tracks, three or five years apart. But to determine such corrections with the requisite accuracy proved to be a laborious process which cost as much, in time and money, as the acquirement of the primary or original quantities themselves. Hence arose the desire for a vessel on which magnetic observations could be made unaffected by any local influence due, for example, to the iron in her construction.

Accordingly, the *Galilee* was returned to her owners in May, 1908, and, with the funds provided by the Carnegie Institution of Washington, the project of building a vessel specially adapted to the varied purposes of ocean magnetic surveys, was undertaken. The designs were prepared by the well-known naval architect of New York, Mr. Henry J. Gielow, following suggestions based upon the experience gained by us during the work of the *Galilee.* The vessel was built by the Tebo Yacht Basin Company of Brooklyn, under the personal supervision of Mr. Wallace Downey. Nearly all materials entering into her construction were obtained in New York or within a distance of about fifteen miles.

Thus the non-magnetic *Carnegie* came into being. Launched in June, 1909, she entered on her maiden cruise of 8,000 miles in the following August. Since then this little vessel has made cruises in the Atlantic, Indian, and Pacific oceans, between the parallels of about 50° N. and 50° S., aggregating in distance four times the earth's circumference; and she will soon leave New York once more, this time for a cruise in the North Atlantic, towards the Norwegian coast and return. Next year, I hope, she will pass through the Panama Canal and enter upon a cruise in southern waters between

the parallels of about 50° S. and 70° S., where no systematic magnetic work has been done since the memorable voyages of the *Erebus,* the *Terror* and the *Pagoda,* seventy years ago.

The *Carnegie* (Fig. 4) is 155½ feet in length over all, 128⅓ feet on the load-water line, 33 feet beam, draught 13½ feet, displacement about 600 tons, and is built almost entirely of wood fastened together with locust-tree nails, copper and Tobin bronze bolts, and composition spikes. Although she is practically a sailing vessel, brigantine-rigged, she has a small amount of auxiliary power, a producer-gas engine, which, with the exception of the

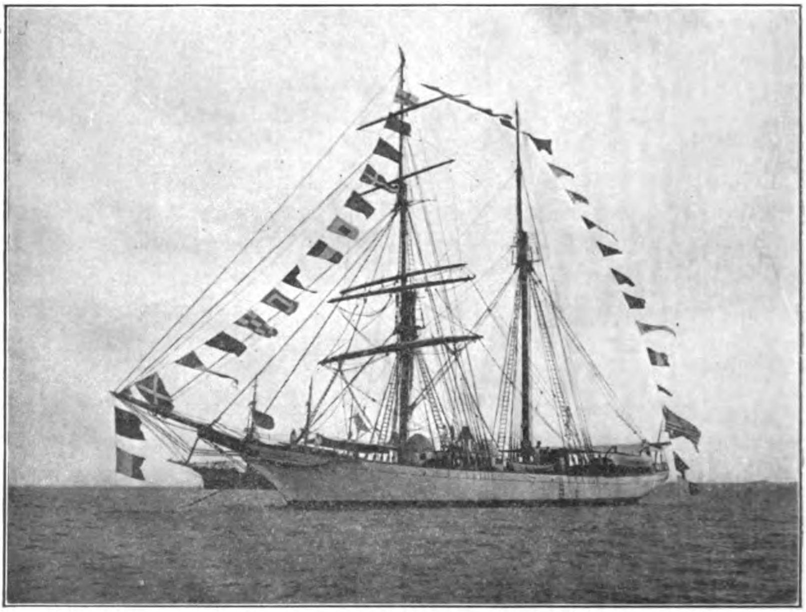

FIG. 4—The *Carnegie* at Bahia, Brazil, May, 1913. Dressed in honor of the port anniversary.

pistons and cams, is wholly built of brass and copper. The small amount of steel, 600 out of 20,000 pounds of metal entering into the construction of the engine, is so far removed from the observing instruments as to have no effect. The anchors, of which there are four, aggregate weight 5,500 pounds, are bronze. The rigging is of hemp, the metal parts being all of bronze or copper. As we could not use iron chains for the anchors, and as a bronze chain of the required strength was too expensive, 11-inch hemp cables, each of 120 fathoms, were adopted; this made it necessary to use the old fisherman windlass.

The three life-boats are non-magnetic, the galley stoves and refrigerating plant of bronze and copper, the sailors' sheath-knives of non-magnetic manganese steel, and our cutlery of Mexican silver. Do you wonder that facetious newspaper reporters have dubbed the *Carnegie* "the most unattractive vessel afloat"? Thomas Hood, in his amusing poem, "The Compass, with Variations," evidently anticipated the *Carnegie*, for he says:

> "They found no gun—no iron—none
> To vary its direction."

And he even remarks: "*Bronzed* mariners were her's to view!"

On the *Carnegie* the instruments are under shelter. The glass dome of the observatory can be revolved like the dome of an astronomical observatory, two of the glass panels being removable, so that both astronomical and magnetic observations may be made with complete protection from wind and weather. Having a vessel in which the deviation-corrections, if any, are on the order of or less than the error of observation, as has been proved by elaborate tests made at various ports, it is now possible to compute the observations on board and know the results within an hour after they are made. On arrival at port, the results are promptly transmitted to the office at Washington, whence they are supplied to the leading hydrographic establishments—to the British Admiralty, the German Seewarte, the U. S. Hydrographic Office, etc. The data of interest to mariners are also being promptly published in each issue of the quarterly journal *Terrestrial Magnetism and Atmospheric Electricity.* Thus the magnetic declinations observed on the *Carnegie* up to her return, last December, have already appeared in print.

The exclusion of possible disturbing effects on the instruments has been carried out quite rigidly. The construction of the observatories is such that it is not possible for a sailor, for example, to bring anything nearer to the mounts of the instruments than eight to ten feet, and the observers are required to state on the observation-forms whether they have removed from their persons all iron or steel articles. The entire personnel is composed of twenty-one men, five usually in the scientific party, and sixteen in the crew, including the watch officers.

This interesting vessel travels at an average rate of about 150 miles a day, from port to port, crisscrossing back and forth in all the oceans. While she carries nearly 13,000 square feet of plain sail, sufficient, with a fair wind, to cover 300 miles a day, and while she has at times, in fact, approximated this speed, no attempt is

made to go beyond 150 or 200 miles, as this is the desired average distance apart for our magnetic observations at sea.

Daily, even under conditions of sea and weather that before the introduction of our appliances and methods appeared prohibitive of the requisite accuracy, are the zealous observers busy with measuring and promptly computing the magnetic elements. And they likewise make the necessary astronomical observations for the navigation of the ship and the determination of the latitude and longitude of the place of observation. They, furthermore, engage in other useful work, such as meteorological observations, determining the electrical elements of the atmosphere, the amount of atmospheric refraction, etc., so that they are busy from early morn until evening twilight. The evening is devoted to amusement. In this way a passage of six weeks or more between ports passes before one is aware.

The *Carnegie,* while working wholly under private auspices, is recognized universally as carrying out a mission not for the good of any one nation but of all nations. In consequence, the privileges extended to visiting men-of-war are accorded to her and she is the object of courteous attention at every port. Her book of visitors contains the names of many noted personages, among whom was Mark Twain at Bermuda, shortly before his death.

A chart (Fig. 2) shows the cruises thus far accomplished by the *Galilee* (1905-08) and the *Carnegie* (1909-13). The latter has now successfully completed, under the command of W. J. Peters, two cruises: the first of 8,000 miles in the North Atlantic between August, 1909, to February, 1910, in which the ports of call were, St. John's (Newfoundland), Falmouth (England), Funchal (Maderia), and Hamilton (Bermuda); the second, a world-encircling cruise of over 92,600 miles, in the Atlantic, Indian, and Pacific Oceans, starting at Brooklyn in June, 1910, and including the ports San Juan (Porto Rico), Para (at the mouth of the Amazon), Rio de Janeiro, Buenos Aires, Capetown, Colombo (Ceylon), Batavia, Manila, Suva (Fiji), Tahiti, Coronel (Chile), Stanley Harbor (Falkland Islands), St. Helena, Bahia (Brazil), St. Helena (second time), Falmouth (England), and ending at Brooklyn last December. The total mileage of the two vessels up to date is about 160,600.

You will observe that the tracks interlace and frequently cross, this being done intentionally in order to supply, by repeating observations at the points of intersection, both desired control and

the necessary data for determining the amount of change in the magnetic elements since an earlier cruise. For similar reasons, our cruises have been arranged so as to intersect the routes of other vessels on which a certain amount of magnetic work had previously been done.

The three magnetic elements, declination, dip and intensity, have been determined along the various tracks at points averaging 150 to 200 miles apart. With our special appliances and with the methods of observing employed, it has been possible to achieve an accuracy in magnetic observations on a moving vessel not hitherto attained. In fact, under fair conditions of sea and weather, and devoting the same amount of time for the ocean work that it is customary to spend in land work, we have demonstrated that the absolute accuracy of the ocean work approaches closely that of the land work in which fixed mounts for the instruments can be had.

The errors in the magnetic declination-charts reached 6° in the Indian Ocean. The errors in the dip-charts amounted frequently to 5° or 6°, and in the horizontal intensity to about 5 per cent. of the value. Often the errors are of the same sign for long stretches; and from the values found at the points of intersection of our tracks, it has been shown that the chart errors are caused, to a large extent, by erroneous secular changes assumed in referring past observations to a later date.

But we must not forget that, although the oceans cover about seven-tenths of the surface of our globe, it is equally important to science, as well as to the geographer and surveyor, to trace the folds of our "gossamer garment, woven of lines of magnetic force" over the land areas as well. This is a matter of no little interest also to the geologist, for many interesting correlations are found between irregularities in the distribution of the earth's magnetism over the land and geologic formations.

Except when approaching land, or in shallow water, the isomagnetic lines over the oceans appear to run smoother than over land. Largely on this account, now that we have a vessel specially suited and have our appliances perfected by an experience of nine years, it is found easier and more expeditious as well, to make an ocean magnetic survey than a land magnetic survey. In the latter case more observations must be made, *i. e.*, at shorter distances apart, in order to eliminate, as far as possible, the purely local effects due perhaps to iron-bearing rocks nearby which affect the magnetic needle. Then again, the transportation over more or less un-

traveled countries presents problems not, in general, inherent in the ocean work. However, before passing to the land expeditions, let us turn aside a moment and consider another phase of magnetic work.

The Sun, a Great Magnet

While on an inspection trip during 1911, to join the *Carnegie* at Colombo, Ceylon, and to visit, en route, various land parties and magnetic observatories, advantage was taken of an enforced three-weeks' stay at Suva, Fiji, to observe the total solar eclipse on April 28, 1911. After various vicissitudes, too long to narrate, with the

Fig. 5—L. A. Bauer's eclipse party and station on Manua Island, Samoa, April 28, 1911.

courteous aid of Acting Governor Schultz (now Governor) of German Samoa, and of Commander Crose (then Governor of American Samoa), I finally reached, on April 26, two days before the day of the eclipse, Manua Island, one of the Samoan group belonging to our country (Fig. 5). This island, being off from the regular line of travel, is rarely visited by the tourist. I, with my effects, was transported there from Pago Pago (Tutuila) on the United States gunboat, *Annapolis,* kindly put at my disposal by Governor Crose, who also gave me the desired scientific assistance by assigning to the proposed work various naval officers, to all of whom I am no little indebted for whatever success was achieved.

Fortunately, through the skill of an experienced pilot furnished by Governor Crose, all instrumental effects were safely landed through the breakers. Not enough can be said of the hospitality shown and assistance rendered by the Samoan inhabitants of the island. Queen Vaitupu quartered the observing party in her own house and the Samoan chiefs provided for our entertainment.

Though the day before the eclipse was cloudy and showery, the following day was clear and sunny. We alone of all the eclipse parties, as it afterwards turned out, were thus favored.[1]

Repeated observation has now clearly demonstrated that the soft, pearly light seen surrounding the sun when the moon blots out for the moment the sun's burning glare, known as the solar corona, passes through a cycle of changes in entire rhythm with the sun's activity as displayed by sunspots and solar eruptions. Furthermore, it has been repeatedly observed by various investigators, that the coronal streamers appear to curve towards the sun's poles as do the lines of force of a magnetized sphere. Hence, the inference is close at hand that, if the sun, like the earth, were a magnet, then perhaps the solar corona is a phenomenon similar to our polar lights. Within a year, it has been definitely proven by Professor Hale, Director of the Mount Wilson Solar Observatory of the Carnegie Institution of Washington, that the sun is indeed surrounded by a magnetic field with lines of force very similar to those enveloping our own planet.

Thus the earth is not alone clothed in "a gossamer garment, woven of lines of magnetic force." If the sun, in spite of its intense heat, at which no magnetism, as exhibited by our permanent magnets, could exist, nevertheless possesses a magnetic field, what is the agency essential for the production of a magnetic field? The query has been raised "whether every large rotating mass may not be a magnet." If the answer be affirmative, picture to yourselves orbs innumerable spinning through space surrounded by pulsating, vibrating fields of force, ever interacting and responding to each other's external influences. Daily are registered at our magnetic observatories messages from without which perhaps some day we may be able to interpret.

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[1] There was shown, on the screen, a reproduction, from a sketch, of this eclipse as seen at sea by Captain Holford of the steamer *Tofua*, and, alongside, a sketch drawn by the late Professor Langley of the eclipse of 1878. The juxtaposition of the two sketches exhibited a remarkable similarity between the two. The interval between the two eclipses was thirty-three years, or three times the sun-spot cycle. The years 1878 and 1911 were years of minimum sun-spot activity.

Land Expeditions

The dots, about 2,500 in number (Fig. 2) show where the observers of the Department have determined the magnetic elements on land. It will be seen that the land observations cover nearly all regions of the globe. The aim is to include in our survey only those countries where no organization exists prepared to undertake such work. The surveys in progress under other auspices are not shown on this map. It is gratifying to say that these surveys are being conducted in cooperation with our design of a general magnetic survey of the globe. The magnetic standards used by the various foreign organizations are compared from time to time with the standards of the Carnegie Institution, thus making possible a strict correlation of all magnetic data obtained the world over.

As an indication of the general interest evinced, the following resolution may be cited, which was passed at the St. Petersburg meeting of the International Association of Academies held in May, 1913:

> "The Committee, in view of the work of making a magnetic survey of the globe, particularly on the oceans, undertaken by the Carnegie Institution of Washington, resolves that it is of the highest importance that similar work be completed as soon as possible, in those countries where no surveys exist or where they have been made at epochs relatively distant from those of the Carnegie Institution of Washington."

It is not possible to individualize here the remarkable work accomplished by our observers. Suffice it to say that many of the expeditions, frequently embracing comparatively unexplored regions, have been attended with more or less danger, and have presented special difficulties which had to be surmounted. They represent geographic achievements as well as scientific work successfully accomplished under trying conditions, *e. g.*, the crossing of the Sahara from Algiers to Timbuktu and thence to Lagos, Nigeria; the complete crossing of China from east to west, of Australia from south to north, of South America from east to west and north to south; extensive canoe expeditions in British North America, etc.

Summary

In a summary or general statement of what has been accomplished from 1905 to January 1, 1914, in execution of the design of the general magnetic survey of the globe, now about two-thirds completed, we may recite the following facts:

Mileage covered on the cruises of the *Galilee* (1905-08) and the *Carnegie* (1909-13), the magnetic elements having been determined completely, on an average, about every 175 miles.	160,600
Mileage covered by land expeditions in the establishment of about 2,500 stations in all parts of the earth, at an average distance apart of 75 miles, roughly	800,000
Total mileage traveled by ocean and land expeditions, in round numbers (or forty times the circumference of the earth)	1,000,000

Number of land expeditions sent out	38
Number of Arctic expeditions cooperated with	4

Number of countries in which magnetic work was done:

Africa	25
Asia	9
Australasia	7
Europe	5
North America	13
South America	12
Island Groups, Atlantic Ocean	8
Island Groups, Pacific Ocean	12
Island Groups, Indian Ocean	3
Total	94

Number of articles and publications by members of the Department, about	125

Construction Work:

A non-magnetic vessel built (the first of its kind).

A building, containing forty-four rooms, erected to provide the necessary facilities for the research work at Washington (Fig. 6).

Seven new instruments devised and constructed, especially designed for ocean and land magnetic work.

While the figures given show that, thanks to the means provided by the Trustees of the Carnegie Institution of Washington, and the zeal of the observers, a large amount of work has been accomplished not of interest alone to the investigator of the earth's magnetism but to the geographer as well, the record we are proudest of is the fact that the entire work has been done thus far without loss of life. The *Carnegie* returned to Brooklyn last December after a successful cruise of 3½ years, during which she covered 92,600 miles in the Atlantic, Indian, and Pacific Oceans, without loss of sail, or spar, or human life. Surely a proud record for the Commander. And as to the land observers, if you will allow me to quote from a recent report:

"It is impossible to refer to the observers individually in calling attention to the devotion, zeal, enthusiasm, and ability displayed in the successful accomplishment of duties well performed, at times under most adverse circum-

stances, in strange countries, amid strange people with strange customs and speaking a strange language; often over infrequently traversed roads and even at times in regions either rarely or never before, as far as known, reached by white man; pursuing the work faithfully, even when revolution was rife in the countries visited and travel was attended with many dangers; following steadfastly in the direction of their goal at no little sacrifice of personal comfort and even sometimes at the risk of life and limb. They have carried on their work in nearly all the regions of the globe from latitude 78° North (Greenland) to 43½° South (New Zealand)''.

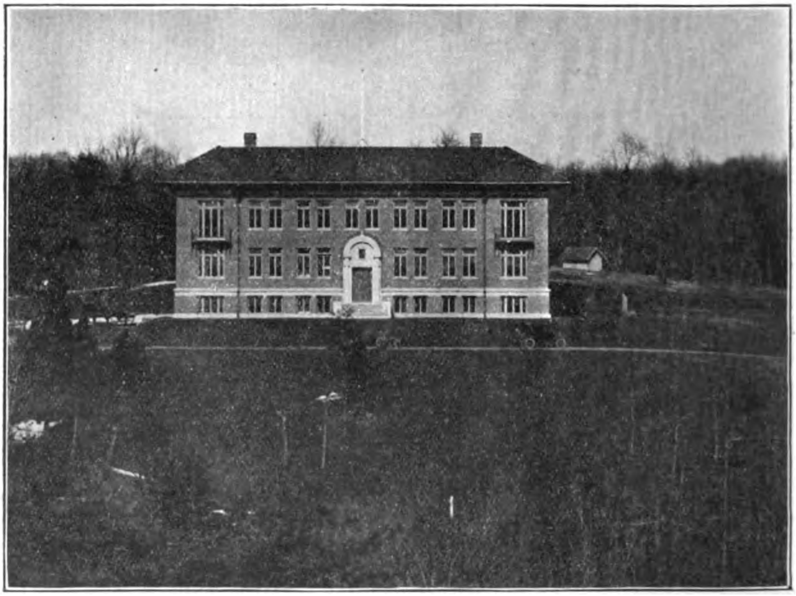

FIG. 6—Newly erected Research Building for the Department of Terrestrial Magnetism at Washington, D. C.

CONCLUDING REMARKS: THE CAUSE OF THE EARTH'S MAGNETISM

Possibly by this time, if not before, you may have said to yourselves: ''Granted that the compass needle points north and south because the earth itself is a magnet, what, in turn, causes the earth's magnetism, why are the magnetic poles not only not situated at the geographical poles, but not even diametrically opposite one another, or why, instead of wandering to and fro with the lapse of time, do not the magnetic poles remain fixed in position?'' Lest any of these questions should cause you sleepless nights, let me say that, for the present at least, it would appear the better policy to confess ignorance. We may also take comfort in the fact that if the student of the earth's magnetism has not yet discovered

the true cause of his science, neither has the investigator of magnetism, in general, been able as yet to answer the question: "what is a magnet?"

The most famous astronomer of his time, Simon Newcomb, one day entered the office of the associate editor of the *Standard Dictionary*, expressing his dissatisfaction with the tentative definitions for the words "magnet" and "magnetism," as based, in the absence of authoritative knowledge of the causes, simply upon the properties manifested. He was promptly requested to try his own hand. After writing and erasing alternately for an hour or more, he finally, with a hearty laugh, submitted the following pair of definitions: "MAGNET, a body capable of exerting magnetic force." "MAGNETIC FORCE, the force exerted by a magnet." Equivalent definitions will be found in Ambrose Bierce's "Devil's Dictionary" and, in explanation, the author cynically remarks that they were "condensed from the works of 1,000 eminent scientists, who have illuminated the subject with a great white light, to the inexpressible advancement of human knowledge."

But after all, it would seem that it is not so much the Why and Wherefore as the Therefore by which human progress is most advanced. Man, as the astronomer Littrow jokingly remarked, is "das Ursachen-thier," who is ever incited and stimulated by his inquisitiveness as to the *cause* of things. Though he may never determine the "Endursachen," or ultimate causes, his inquiries lead him to acquire a vast amount of data with the aid of which he at least finds out the laws governing the phenomena under investigation.

The accumulation of data must at present be the chief aim of the student of the earth's magnetism. Perhaps no other subject can furnish more instances that, while theories as to the why and wherefore, though propounded by the most enlightened of the age, are short-lived, the facts accumulated by observation and experience remain as permanent acquisitions to the storehouse of human knowledge. In the words of Robert Louis Stevenson, whose island home we visited:

> "To travel hopefully is better than to arrive,
> And the true success is labor."

CUZCO AND APURIMAC

A REPORT ON THE COMMERCIAL AND INDUSTRIAL OUTLOOK OF SOUTH CENTRAL PERU

By OSGOOD HARDY, M.A.*

The object of this report is to give as much information as possible about the portion of south central Peru represented by the Departments of Cuzco and Apurimac, from the standpoint of their commercial and industrial possibilities. The natural resources and their uses are considered first, followed by a discussion of present conditions and possible relations with the outside world. Two months were spent in the Cuzco basin. Three months were spent in making a circuit from Cuzco *via* Abancay, across the Apurimac at Pasaje, over the cordillera to the Urubamba River at Santa Ana, up the river to the city of Urubamba, and then back again to Cuzco. This afforded an opportunity to see conditions at altitudes varying from 4,000 to 17,000 feet above sea level, giving an acquaintance with the tropical, temperate and frigid zones of Peru (Fig. 1).

Although Peru is a country of great mineral wealth, mining is at present of little importance in the territory under discussion. For a number of years after the Revolution (1821-24), the Portuguese operated some silver and copper mines near Vilcabamba, but these have long since been discontinued. Coal and iron deposits seem to be nil, although a small vein of the former may be seen near San Sebastian in the Cuzco basin. A small excavation was made by the Southern Railroad of Peru, but it was found unprofitable, and at present all the coal for this region has to be shipped from Mollendo. At Juliaca some rumors were heard about the Ferrobamba copper mines. Although these were not then active, it was thought that when communications were opened up, they would become very valuable. Later, in Cuzco, an American engineer in the employ of the company, expressed a similar opinion in regard to its future. The offices of the Inca Mining Company at Tirapata are passed on the way up from Mollendo. Although it has been active in the past, it was not doing anything in 1912. These are the only evidences in the two departments of active mining in recent years. One is constantly hearing of rich prospects. For instance, at Paltaybamba, a

* Mr. Hardy was Assistant on the Peruvian Expedition of 1912 under the auspices of Yale University and the National Geographic Society.

sugar plantation on the Vilcabamba River, one half day's journey from where the river empties into the Urubamba, the proprietor will gladly show the visitor silver and copper ore which "needs only capital to produce rich dividends."

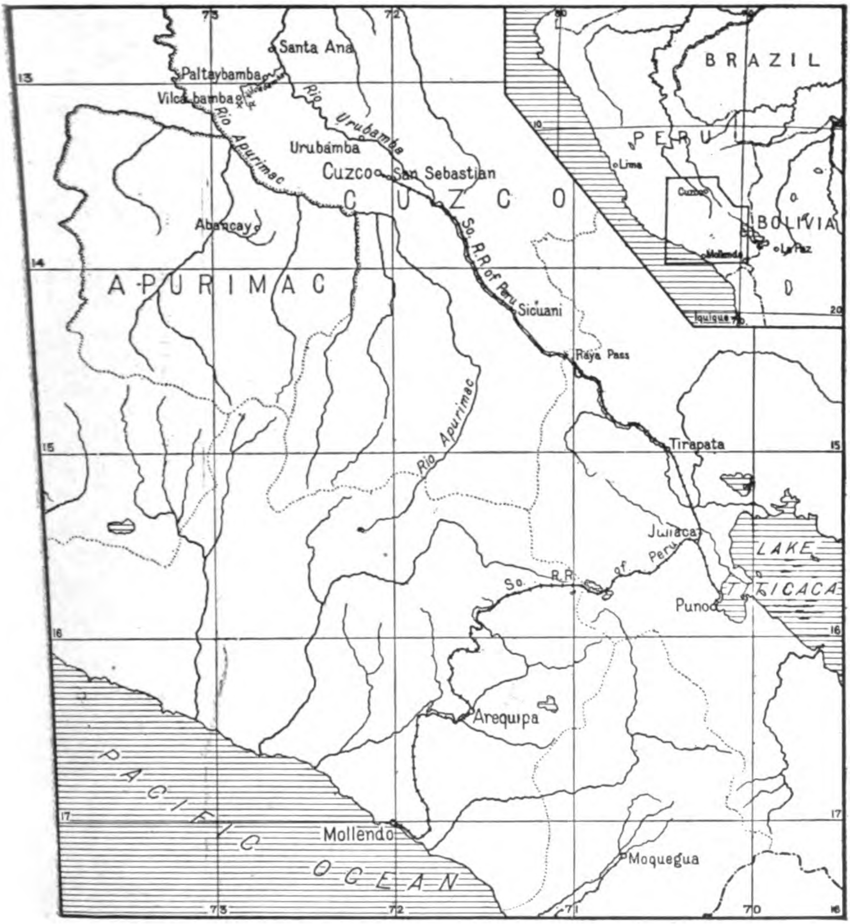

Fig. 1—Sketch Map of South Central Peru.

In considering the vegetable products it is well to have clearly in mind the topography of the regions visited. For the most part this is a high *puna* country, a rolling plateau covered with thick clumps of *ichu* grass which is useful as fodder and thatch. The plateau is broken by numerous deep and steep-sided river valleys. The only wild vegetation is the grass on the highlands, and under-

brush on the sides that becomes denser on the lower slopes until, in the valley bottoms, where there is rain enough, it becomes a dense tropical jungle. No timber growth, however, is especially valuable. On the plateaus there are a few *molle* or pepper trees similar to

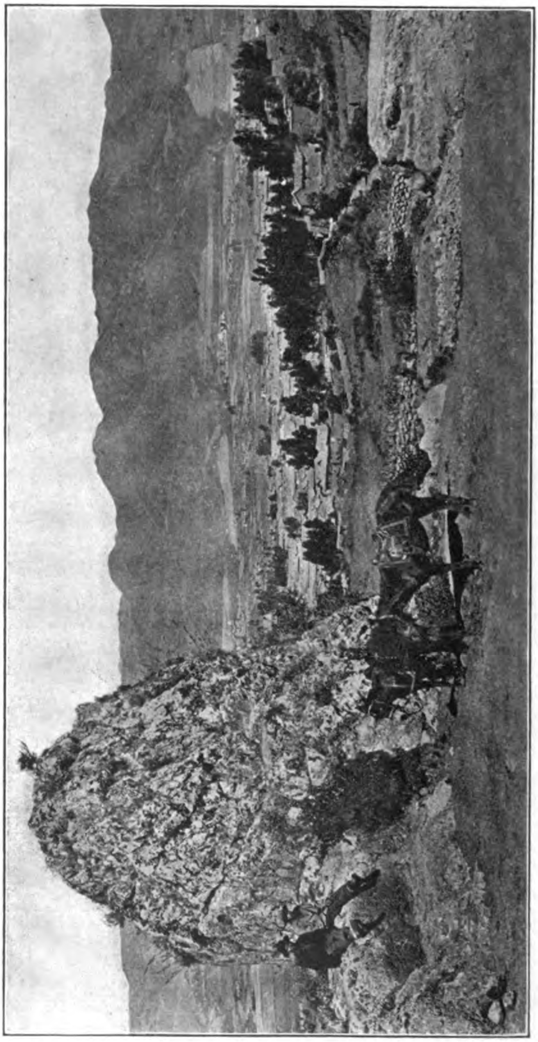

FIG. 2—Cuzco. Recoleta ruins. Seats cut in rock. Cuzco city in distance.

those in California, but much smaller than those of that state. Eucalyptus is a success wherever cultivated. Although crooked and gnarled, the tough and hard timber of the valleys is used to advantage by the Indians in making their agricultural implements.

The lack of any tree growth around Cuzco has given rise to a considerable trade in wood taken from the valleys to the city, where it is used as fuel for cooking purposes (Fig. 2). The Urubamba valley is the chief source for this trade. A large number of the river valleys have but a scanty growth, and where the Apurimac was crossed at Pasaje, nothing but extensive stretches of cactus and thornbush were encountered. The scarcity of timber may be best illustrated by the fact that the railroad ties are shipped from the United States, and that the telegraph poles are made from iron, to resist alike the ravages of man and insect. Some of the hard woods of the tropical valleys are handsome and might be used for cabinet purposes were they not so difficult of access.

Fig. 3—Grinding maize at Colpani. A native hut.

The cultivated vegetable resources may be divided into three classes according to altitude. Above 12,000 feet, the only plant grown is the potato, which is a native of this region and Bolivia. It is of good quality although small, but is seldom eaten until after it is subjected to a drying and freezing treatment which reduces the weight considerably, makes the tuber more wholesome according to report, and certainly adds an insipid quality that renders it highly unpalatable to the average foreigner. As the potato belt extends from 13,500 feet down only to 8,000 feet, there is a large trade in carrying potatoes to the valleys below. From 12,000 to 10,000 feet, wheat, barley and oats are raised extensively, while from

10,000 to 8,000 feet maize is added to the list of cereals (Fig. 3). Around Cuzco, grain is the chief article grown, and the upper Urubamba valley is known as the bread region of the country. Below this limit, the Apurimac and Urubamba valleys are lined with cane and coca plantations, the former producing sugar, *chicha* (a native drink corresponding to our cider), and white rum, while the coca plant provides a leaf that the natives are constantly chewing (Fig. 4). The tropical fruits, oranges, limes, bananas, alligator pears, etc., all grow here and are of excellent quality. Few of them are shipped excepting from the valleys to such centers as Cuzco and Abancay, the markets for the fruits of this region.

This part of Peru is not very well supplied with wild animal life. The vicuña, the smallest of the camel tribe, a cousin of the llama, alapaca, and guanaco, and like the last in that it has never yet been tamed, is occasionally seen. Blankets made from its wool, and costing from $25 up, are in fair supply, which seems to indicate that its destruction goes on in spite of the law prohibiting it. In the mountains a small rodent called the viscacha lives among the rocks, while mice, guinea pigs and foxes are found in the lower *punas*. Bears and jaguars are said to make their appearance at times in the wilder portions of the country. Deer are quite plentiful in the cordillera between the Apurimac and Urubamba rivers and supply very good venison. Birds are numerous in all sections. In the mountains, the condor is almost constantly in sight along with falcons, eagles, Andean gulls, black ibis, egrets and crows. Around the wetter parts of the *punas* there is a great variety of ducks, geese and flamingoes, with plover and partridges in the drier parts. In the valleys, parrots, humming-birds, thrushes, and countless other birds are always present. The rivers are said to be filled with fish but no evidence of this was obtained. The fish consumed in Cuzco come from Mollendo or Lake Titicaca.

There are, however, a large number of domestic animals. Around Cuzco the first to be mentioned is, of course, the llama, useful as a beast of burden and for its wool. It is used chiefly above 10,000 feet and almost exclusively by the Indians. Its value as a means of transport is limited by the fact that it can carry only loads weighing less than 100 pounds. After it becomes too old to work the Indians kill it, using the flesh to make a kind of jerked meat. The ordinary price of a llama is about $5. Sheep are grown in the puna region, their value depending chiefly on the length of time since they were last sheared. As a result it is often quite difficult to purchase them and prices vary from seventy cents to several dollars.

They are largely used by the natives for food, and in almost every pack train the carcass of a sheep may be seen. Goats are raised exclusively in the rocky sections and are valued largely for their wool. Cattle raising is carried on to some extent between 8,000 feet and 13,000 feet, principally for hides, although there is a small

Fig. 4—Santa Ana. Near view of coca plant.

market for beef in Cuzco. The demand for dairy products is strong and at present far surpasses the supply. The natives do not understand the use of cream, but use a great deal of milk with their coffee. In the Cuzco basin there are a number of fine oxen, used

for agricultural purposes. Horses are of course abundant. Most of the owners of the haciendas have very good mounts, but the average Indian's horse, when he has any, is a rather poor specimen. In fact, when the writer landed in New York on his return, the horses there seemed so large that it was some time before he could become accustomed to their size. The great mainstay of the region for transportation purposes is the mule, smaller than the American mule, but with a better disposition, and with marvelous ability in mountain climbing. A good mule is worth from \$50 to \$100, while \$150 is not an uncommon price for an exceptionally good one (Fig. 5). Burros are largely used by the Indians, but are not valuable, as they can carry only small loads. All these animals have the idiosyncrasy of thinking they are roped the moment they feel the

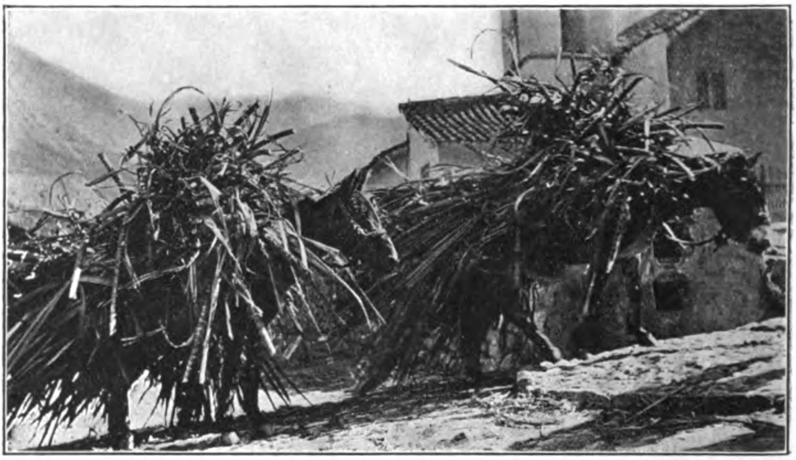

FIG. 5—Huadquiña. Mules carrying cane.

line fall across their necks, and will invariably stop without giving the rope a trial as would an American beast. In the valleys they are greatly troubled by the *murcielago,* a vampire bat which attacks them at night and sucks their blood. In large measure these can be kept off by the use of blankets. It was further observed that the animals whose backs were in good condition were generally unmolested. The natives seem to take no precautions against these pests. At Pasaje, all the animals had been killed off, while in the Urubamba valley, the majority seemed to be in a weakened condition.

These are the natural resources of this part of Peru. It remains, then, to consider its relation with the outside world. Since the

building of the Southern Railroad, communication with Cuzco has been fairly easy. The mail service is good as far as first-class matter goes, but all packages should be sent by registered mail. The city of Cuzco itself has a small telephone system, and has two outside telegraph connections, the government line extending to Lima, and the railroad line connecting with Mollendo *via* Arequipa. By these lines, cables messages may be sent to all parts of the world. Mollendo, the port of entry for this region, is served by a number of steamship lines, the most important being the Royal Mail, the Pacific Steam Navigation Co. and the Peruvian, Chilean, and Kosmos lines. These lines make weekly and fortnightly calls, an average of over thirty vessels entering the port every month. Freight is handled also by a number of private lines such as that of W. R. Grace & Co. At the present time it takes six and a half days from Panama to Callao, and two days from there to Mollendo. From Mollendo to Cuzco is a matter of three or four days according as one takes the weekly express or the twice-a-week local. All steam communication ends at Cuzco, and from that point one has to employ the mule, burro, llama, or Indian, the mule pack train being the common method of transportation. The average price for the mule pack train was quoted as about a half cent a pound of freight per day, covering a distance of from fifteen to twenty-four miles, depending on the gradient of the trail. There is only one road in this section, the old stage road from Cuzco to Sicuani. With the coming of the railroad the old stage line went out of business, and with its departure the number of wheeled vehicles has been reduced almost to zero. While the writer was in Cuzco only one was seen.

For the average foreigner the next question relates to the climate. Around Cuzco it is excellent. During June and July it is cold, with ice on the water in the mornings, and snow on the mountains. It grows warmer through August, September and October, but remains without rain during these months. In November the rains begin as daily thunder showers, increasing in duration until in January and February it rains almost continuously, decreasing again through March, April, and May. The same conditions prevail in the greater part of the region, the rains being somewhat later in the lower country, while in the higher portions between the two great rivers the sky is overcast the greater part of September and October, with weekly rains. Along the river valleys the climate is quite trying. It is very hot and sticky, with the ever present fly and mosquito to emphasize the fact. If one enjoys hot weather,

however, this valley climate is in some places very delightful. To the writer, the climate of the Urubamba valley around Santa Ana seemed particularly pleasant.

In Cuzco there is a great deal of typhoid fever, due to the unsanitary condition of the city. On the higher plateaus, when we were there, smallpox was decimating the population frightfully and little or no effort was made by the government to help stamp it out. Malaria was quite prevalent in the valleys, but did not seem to cause much alarm. These diseases, however, need not affect the foreigner who takes the trouble to be vaccinated for typhoid and smallpox before leaving home for Peru, and uses quinine as a prophylactic while in malarial districts. Dysentery is more dangerous and nearly every one suffers more or less from it. This, however, can be held in check by sufficiently large doses of bismuth subnitrate. The great trouble is that not enough of the drug is used before the disease becomes serious. While there is much disease, the ordinary foreigner may escape by taking necessary precautions. In this region there is no medical aid to be obtained excepting in Cuzco. Dangerous cases have to be taken to Arequipa, where the treatment is poor in comparison with that of our own country. There is a great opening for a competent medical man in this part of Peru.

The next consideration for any one who contemplates starting an industry here is the labor supply. This region suffers from the same trouble that is affecting the rest of Peru. Time and again, as an excuse for the dearth of labor, we were told: "No hay gentes,"—there are no people. Even the Peruvians cannot get a sufficient labor supply to carry out their own projects. The country is, for the most part, divided into haciendas or *fincas* with areas varying from a few hundred acres to those whose owners count their land by the square mile, as in the case of the hacienda Huadquiña which has a frontage of thirty miles on one river and forty on another. The difference between a hacienda and a *finca* is the same that marks the difference between a farm and a plantation in the United States, that is, a difference in location. But there is this distinction that, in the United States, a farm is usually a landed estate in the North, while a plantation is a landed estate in the South. In Peru a *finca* is a landed estate in the uplands, where it is cool, while the hacienda is in the warm valleys of the lowlands. The labor in both cases is performed by Indians who receive their houses, a small portion of land for tillage, and some grazing privileges free of charge. In return they are bound to work for the proprietor when necessary

at wages varying from ten to fifty cents a day. The estates are usually in charge of a *mayor-domo,* the owners preferring the life of the larger cities.

In spite of the high birth rate, from ten to fifteen children being the usual number, the population is not greatly increasing as infant mortality is very high and the diseases mentioned above exact a fearful toll. In addition, the supply of labor is not so great as the total population would seem to indicate, for labor efficiency is low. The Indian has no ambition, perhaps because of the repression of his ancestors in the colonial period, or owing to the effects of constant coca chewing. At any rate, all the Indian wants is barely enough to live on. Higher wages, therefore, offer no inducement to him to

Fig. 6—Huadquiña. Indian Houses.

work harder, but rather less. Further, he has to stop every few weeks to celebrate one of the innumerable feast days. To these must be added other days devoted to sobering up, for no feast is properly celebrated unless a large part of those engaged in it become intoxicated. As the Indian's food is chiefly parched corn, dried mutton, and potatoes, the production of which requires only a minimum of work, it will be seen that there is little inducement for him to work—consequently he does not (Fig. 6).

In every line of work the people are very primitive. The laborer's tools are such as have been in use for centuries. They are the short-handled, broad-bladed hoe, a spade with a knife-like blade three inches wide and a foot long, with handle some ten feet in length,

and the machete, used chiefly in the valleys in cutting sugar cane and clearing the underbrush. Of these, the hoe is chiefly used, the spade being seen only in connection with potato growing. In the management of the estates we found a variety of conditions. In one, for example, we found a modern hydro-electric plant which did all the work of crushing, and supplied light for a very fine hacienda. The crushers and electric plant were of American manufacture, while the distilling plant was of German make; which was true of every hacienda visited. In contrast to La Estrella, we found at Santa Ana that the water power was applied directly to the crushers, and the still was several hundred years old. In another place, where the most primitive methods were in use, the crushing was done by ox power. In the grain region, conditions are even less modern. The plowing is done mostly with a wooden plow drawn by oxen or by hand. The grain is cut with a sickle, carried to the threshing floor on the backs of Indians or burros, and threshed with curved sticks or by the treading of oxen. There seems to be a better knowledge of irrigation methods, due, no doubt, to the inheritance of the old water systems of the Incas, which were very well laid out.

The sugar plantations are in the larger river valleys near the streams, as frequent irrigation is necessary for the best growth of the sugar cane. In the rainy season, irrigation may be dispensed with, but in the dry season it is extensively carried on. In this industry considerable skill is shown, rotation of crops is practiced, and the cane is planted and cut at such intervals that there is always a supply ready for the crushers. The time necessary for growth varies with the amount of water available and the climate. On the Apurimac, at Auquibamba, it was found that only three cuttings were possible at intervals of three years, three years after planting. At Santa Ana, on the other hand, the first cutting takes place one year from the planting, and goes on annually for ten years before it has to be replanted. The coca industry is said to pay better than the sugar industry where both can be carried on. The leaves (the commercial product) are picked by women from the low shrub, which is planted in long rows for irrigation and much resembles a field of belle-peppers in California. The leaves are then dried for a day, during which they are constantly turned over and over, and then packed in banana leaves ready for shipment.

In the light of these conditions it is doubtful if there is a wide opening for modern agricultural machinery in this section. Although the climate is favorable, the labor supply is lacking. The chief hindrance, however, is the lack of good transportation facilities

from the valleys to the markets, both local and foreign. At the present time, none of the haciendas are working to their full capacity, as the market for sugar and rum is quite well supplied. The only remedy lies in export, but the transportation facilities are anything but favorable. Modern agricultural methods would increase the output, but not the demand. All the goods would have to be transported to Cuzco by mule and from there shipped by rail at very high rates to Mollendo, with high steamship rates. From no standpoint, therefore, is there as yet much inducement for foreign capital to enter this region to start agricultural industries.

With regard to advantages offered to manufacturers it may be said that wool is the only raw material that would be an asset, and this would be more than offset by the poor labor supply, the high cost of transportation, and the fact that the Indian is quite willing to see his wife do the family spinning and weaving. Cotton is manufactured in some parts of Peru, but not in this region. There are several woolen factories in and around Cuzco, but they have not as yet built up a large trade. It is likely that the Indian will not be enticed from his home-made poncho for some time to come. The only growing industries are those of some brewing companies. The German breweries are doing a large business, but the National Company is not as yet very successful. The market for beer is limited by the fact that the Indian still prefers his native *chicha* made from corn in the uplands and from sugar cane juice in the valleys, and the number of Peruvians of the upper class here is relatively small.

For the American manufacturer who wishes to sell goods here, the outlook is slightly better. In 1909 Cuzco was reached by the railroad, which is beginning to bring to the inhabitants some of the comforts and labor-saving devices of civilization. There is at present a constant demand for a few lines such as cotton goods, canned foodstuffs, cheap grades of hardware, paints and oils, patent medicines, toilet preparations, etc. These are the goods that find readiest sale here.

The Departments of Cuzco and Apurimac have a population of 615,000, according to the census of 1896. The vast majority are Indians with simple wants. It is possible that new wants may be created and new methods taught, but it can be only by actual and repeated demonstrations of the advantages offered. In developing these demands the exporter will find that he must grant long term credits; ascertain just what is wanted and supply exactly that; spend much money in developing trade without expecting imme-

diate returns, and attend very carefully to the details of packing and shipping. Even when these conditions are met, the opportunities for foreign trade are slow in developing. The people are poor, unambitious, and content with their lot. Any campaign of trade here must be primarily one of education.

COL. ROOSEVELT'S EXPLORATION OF A TRIBUTARY OF THE MADEIRA

Col. Roosevelt's lecture before the National Geographic Society of Washington on May 26, as reported in full in the *New York Times* of the following day, affords the first general account of his recent descent of a hitherto unknown tributary of the Madeira. The narrative of his trip across South America which is appearing in *Scribner's Magazine*[1] has, in the last number available, only progressed as far as São Luiz de Cáceres (16° S.) on the upper Paraguay and, therefore, does not include this part of his journey.

Although not intending to undertake original exploration, Col. Roosevelt, prior to his departure for South America, had already decided to return, not by the conventional trip by sea along the west coast but, instead, by crossing the continent from south to north. From Buenos Aires he planned to ascend the Paraná and Paraguay Rivers and cross over into the Amazon basin. On hearing of his plans in Rio de Janeiro, Dr. Lauro Müller, Minister of Foreign Affairs of Brazil, made arrangements to have Col. Roosevelt met at the Brazilian frontier by a colonel of the Brazilian army, who was to accompany him over the divide to the headwaters of the river selected for the descent into the Amazon basin and probably go with him for the whole distance. The selection of the tributary of the Amazon to be followed was determined by a possibility which Dr. Müller pointed out to Col. Roosevelt. Col. Candido Mariano da Silva Rondon, the officer delegated to accompany Col. Roosevelt, had for years been engaged in exploring the ill-known highlands of Matto Grosso. In 1907 he had been sent by the Brazilian government to explore the region on the divide between the headwaters of the Madeira and the Tapajoz and to construct a telegraph line to the rubber settlements on the Madeira. On this occasion he and his assistants surveyed for the first time the Gy-Paraná and the Juruena, the former an important tributary of the Madeira, the latter, of the Tapajoz. A couple of days' march northwestward from a station he established on the divide between the Gy-Paraná and the Juruena, which he named José Bonifacio, he, in 1909, came across the headwaters of a river running northward between

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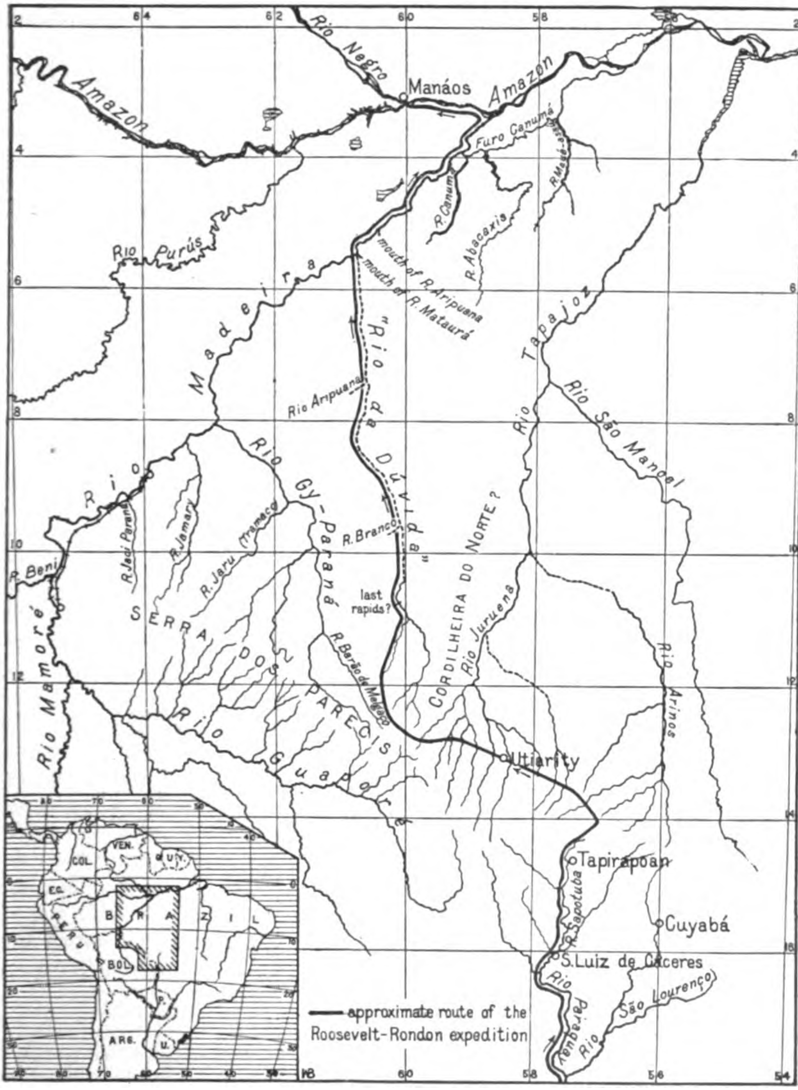
[1] Theodore Roosevelt: A Hunter-Naturalist in the Brazilian Wilderness, *Scribner's Magazine*, Vol. 55, 1914, pp. 407–435, 539–558 and 667–680.



Sketch map showing the general course of the newly discovered tributary of the Madeira and the approximate route of the Roosevelt-Rondon expedition. Scale, 1:12,750,000.

The inset shows the location and extent of the main map.

The drainage of the region between the headwaters of the Paraguay and the upper Madeira is based on the surveys of Col. Rondon's expedition of 1909 (see footnote 2). In the north, only the surveyed portions of the Canumá, Abacaxis and Maué-assú are shown.

these two river systems.[2] As to where it debouched, he could only guess, although he believed it emptied into the Madeira. As all inferences with regard to its course were mere conjectures he entered it on his sketch maps as the Rio da Dúvida, or the River of Doubt. It was the possibility of following this river to its mouth that Dr. Müller suggested, a proposal which Col. Roosevelt gladly accepted.

The expedition as constituted at the outset of this trip consisted of two parts, the members of Col. Roosevelt's party and the assistants of Col. Rondon. The expedition was officially designated, after its leaders, "Expedição Scientifica Roosevelt-Rondon." The Roosevelt party included: Kermit Roosevelt, Col. Roosevelt's son; George K. Cherrie, ornithologist, and Leo E. Miller, mammalogist, representing the American Museum of Natural History of New York City; Anthony Fiala, best known as commander of the second Ziegler polar expedition of 1903-05, who had charge of the equipment; Father Zahm, late of Notre Dame University, Indiana; Frank Harper, Col. Roosevelt's secretary; and Jacob Sigg, hospital nurse and cook. Col. Rondon's companions included Captain Amilcar de Magalhães; Lieutenants João Lyra, Julio Barbosa, Thomas Reis, Joaquim de Mello and Alcides de Sant' Anna; Dr. Euzebio de Oliveira, assistant geologist of the Serviço Geologico e Mineralogico do Brasil; Frederico Hoehne, botanist; and two assistant taxidermists. Frank Harper went only as far as Tapirapoan (14½° S.), while Father Zahm and Jacob Sigg accompanied the expedition to Utiarity (13° S., see below).[2a] The party which descended the unknown tributary of the Madeira finally consisted only of Col. Roosevelt, Col. Rondon, Kermit Roosevelt, Cherrie, Lieut. Lyra and Dr. Cajazeira, a Brazilian physician, besides sixteen men. Fiala reached the Amazon via the Juruena and the Tapajoz, while Miller, Lieut. de Mello, Dr. de Oliveira and one of the taxidermists descended the Gy-Paraná and the Madeira.[2a]

On January 5, 1914, the expedition had reached São Luiz de Cáceres on the upper Paraguay. From here to the headwaters of the newly explored river the route of the party can not be given with definiteness inasmuch as the two sources cited above leave a gap with regard to this part of the journey. At all events, the party traveled by mule and ox-train in a northerly and then in a northwesterly direction across the highland region which carries the Amazon-Paraná divide, at first following up the Rio Sapotuba, near the head of which the party reached Tapirapoan on January 16. At Utiarity, in 13° S. on the Papagaio, one of the source-streams of the Juruena, the party, it seems, divided

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[2] An account of these explorations, by H. Wichmann, based on the original which appeared in the Dec. 24, 1909, Jan. 15 and Feb. 27, 1910, issues of the *Jornal do Commercio*, a daily newspaper of Rio de Janeiro, and entitled "Col. Candido Rondon's Expedition im brasilischen Hinterlande" will be found in *Petermanns Mitteilungen*, Vol. 56, I, 1910, pp. 260–261. It is accompanied by a map (Taf. 47) on the scale of 1:7,500,000, which shows, in red, the hydrography of the entire region between the headwaters of the Paraguay and the upper Madeira as resulting from Col. Rondon's surveys, superimposed over the drainage system of the region according to the prevailing conception, shown in black. This striking comparison shows that hardly a river in this extensive tract flows where it was supposed to. The greatest discrepancies relate to the Gy-Paraná and the Jamary. The upper course of the former lies nearly a degree and a half farther west than supposed, a fact to which Col. Roosevelt called attention in his lecture; while the latter in its entirety bears no resemblance whatsoever to its counterpart on existing maps. Instead of rising in 12° S. and 61° W. and flowing northwest, it rises in 11° S. and 64° W. and flows north. On the accompanying map the drainage of this whole region is based on Col. Rondon's surveys.

[2a] Information kindly furnished by Dr. Frank M. Chapman, of the American Museum of Natural History.

into the three groups which were each to reach the Amazon by a different route. The Roosevelt-Rondon party in due course came upon the headwaters of the "Rio da Dúvida." On February 27(?), in 12°1′ S. and 60°18′ W., they embarked on this river, which was to carry them northward into the Madeira.

The general course of this hitherto unknown affluent of the Madeira is given as follows (allowance is made for the discrepancies occurring in the newspaper version of Col. Roosevelt's lecture in Washington): It rises in the highland of western Matto Grosso just north of 13° S. and between 59° and 60° W. at an elevation about 1,000 feet above its mouth (at its confluence the Madeira is about 85 feet above sea level). In its upper course it flows first west and then south, and finally north[3]—a mountainous, timber-choked brook. It is not navigable above the point where the party embarked, which is about 180 miles downstream from its source. From here it flows north for its entire length between the 60th and 61st meridians, approaching the latter most closely in 8°15′ S. It empties into the Madeira in 5°30′ S. From about 11°45′ S. to 10°45′ the river is an almost unbroken series of rapids. Two are designated by name: the first encountered were at Navarite in 11°44′ S.; those met with in 11°12′ S. were named Peishan Rapids. Below the last rapids (10°45′?) the river flows smoothly and has considerable volume. At the junction with the so-called upper Aripuana a volume of 4,500 cubic meters (159,000 cubic feet) per second was measured. This would be more than the mean annual discharge of the Hoang-ho or the Indus and more than three times that of the Rhine.[4] The following tributaries entered the main stream: in 11°23′, the Rio Kermit from the left; in 11°22′, the Marcian Avila from the right; in 11°18′, the Taunay from the left; in 10°58′, the Cardoza from the right; in 9°38′, the Rio Branco from the left; and, finally, from the left, in 7°34′, the Aripuana, which is practically of the same size as the main stream. The estimated length of the river from source to mouth, including sinuosities, is 1,400 to 1,500 kilometers (870 to 930 miles). This would make it somewhat longer than the Rhine and somewhat shorter than the Ohio. The astronomical observations on which these positions are based were made by Lieut. Lyra. Readings were taken at about every half degree or every degree of latitude.

The whole journey from the point of embarkation to the mouth, which was reached about April 30, took about 62 days. During the first four days (Feb. 27-Mar. 4?) the river was slowly descended to 11°45′, and a careful survey of this section of its course was made. The journey from here, where the first rapids were encountered, to 10°45′, where the rapids seem to have ended, consumed 42 days (Mar. 4 to Apr. 15?). Two days later, on April 17(?), the uppermost camp of the rubber men was reached in 10°24′, and eleven days later (Apr. 28?), in 7°15′, the party was met by Lieut. Pyrineus[5] on the steamer which Col. Rondon had previously directed him to take up the Ari-

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[3] On the map in *Petermanns Mitteilungen* the headwaters of the "Rio da Dúvida" (referred to in the text as the Rio Doze de Outubro, probably from the date of its discovery in 1909) are represented as on the accompanying map. This does not quite tally with the course as here described.

[4] (Sir) John Murray: On the Total Annual Rainfall on the Land of the Globe, and the Relation of Rainfall to the Annual Discharge of Rivers, *Scott. Geogr. Mag.*, Vol. 3, 1887, pp. 66–77, specifically Table VI, on p. 76.

[5] Probably the same, who, on Col. Rondon's expedition of 1909, explored the Rio Jaru, or Tramaco, a left tributary of the Gy-Paraná. In the account of Col. Roosevelt's lecture his name is spelled "Pyrinez."

puana on the assumption that this would prove to be the lower course of the river they were to follow. On this steamer the party descended the river to its mouth, and then proceeded down the Madeira and up the Amazon to Manáos, which was reached about May 1.

The trip was attended by no inconsiderable hardships. Of the seven dug-out canoes in which the party started, five were lost in the rapids, and of the three others which were then built, one was wrecked. One of the native paddlers was drowned. Under the strain of the trip another man went mad, shirked all his work, stole his comrades' food, and, on being punished, murdered his superior (Sergeant Peishan, after whom one of the rapids was named), and fled into the wilderness. Col. Roosevelt himself suffered an injury to his leg when his canoe upset. Col. Rondon had a narrow escape from death. While hunting monkeys for food, his dog, which preceded him, was killed by Indians, whose arrows would probably otherwise have struck him, had he not been warned of their presence by the dog's cry. The arduous trip down the rapid-interrupted stretch of the river told heavily on the party's food supply: at the end of this stage of the journey they had used up about three-fourths or four-fifths of their rations, although only about one-sixth of the distance had been covered. Fortunately, at the rubber camp which was reached two days later, some food was procured—sugar-cane, rice and bananas. Conditions were such that everything not absolutely necessary had to be discarded: personal belongings were reduced to the clothes on each man's back, with a spare set of underwear. Even part of the medicine was thrown away. Of the instruments only those needed for the determination of positions were kept.

The geographical results of the trip are of no mean value. In the first place a tributary of the Madeira, hitherto unknown in its entirety, was traced from source to mouth. Col. Roosevelt in his lecture makes it plain that its lower course was known to the rubber men, although it had never been surveyed and was not correctly represented on existing maps. The reference in the lecture to Lieut. Pyrineus's meeting the party coming down, after he had ascended the river known, at its confluence with the Madeira, as the Aripuana, seems to indicate that it is this river which coincides with the lower course of the new river. The Aripuana, however, joins the Madeira in 5°7′ S. according to the standard map of the latter.[6] The mouth of the new river is given by Col. Roosevelt as lying in 5°30′. This position would more closely correspond with the mouth of the Mataurá River, which debouches into the Madeira in 5°28½′. On large-scale maps of the region[7] both the Mataurá and the Aripuana are shown to be rivers of considerable length rising to the south, so that from this point of view both could come into consideration. Identification is further complicated by references in the lecture to a "so-called upper Aripuana" and to a "Castanha branch." With regard to the former the

[6] The Madeira River from its Mouth to the Falls of San Antonio. Surveyed by Comdr. T. O. Selfridge and the officers of the U. S. Ship *Enterprise*, June and July, 1878. [1:100,000.] In 5 sheets. U. S. Hydrographic Office Charts Nos. 893–897. Washington, 1882.

[7] *e. g.:* Mappa Geographico do Estado do Amazonas. Organizado por Ermanno Stradelli de accordo com suas notas e exploracões e baseado nos melhores mappas. 1:2,222,000. V. Porta, Piacenza, Italy, 1901. (The bibliographical list printed on this map indicates a knowledge of the sources which inspires confidence in its reliability.)

Estado do Amazonas: Mappa organisado por Ermanno Stradelli e publicado na administracão do Exmo. Senhor Dr. A. Constantino Nery. 1:1,111,000. 1a Edicão. Aillaud & Ca, 1906. (Wall map).

impression received is that the new river, although the main stream, has locally been interpreted as a branch of the Aripuana and that the name Aripuana is applied both to the tributary entering the new river from the left in 7°34′ and to the new river below this confluence. But this matter as well as all questions concerning the definite location of the new river cannot be settled until the appearance of a map showing its course.

All conjectures as to the hydrography of the region between the Madeira and the Tapajoz, which are based on existing maps, must prove misleading. Although the majority of standard and official maps[8] indicate a comprehensive hydrographic system in this region, they are based, as a competent critic has well observed, "in spite of their copious nomenclature and the inextricable network of their river systems, only on the vaguest data."[9] Col. Rondon's surveys in the Gy-Paraná region, with their sometimes almost complete reversal of previous conceptions as to the drainage system, are an excellent illustration of this. Of all the river courses figuring on the maps between the Madeira and the Tapajoz, only the Canumá, Abacaxis and Maué-assú are based on surveys of any kind,[10] and of these the southernmost (that of the Abacaxis) does not extend much further south than 6° S. The Roosevelt-Rondon expedition has, therefore, made a major contribution towards solving the problem of the hydrography of the region. We now know definitely in the area under discussion the position of the Gy-Paraná in the southwest, of the new river running meridionally through the whole area from south to north, and of the Abacaxis in the north. This makes it highly probable that the new river, as Col. Roosevelt has stated, is the longest affluent of the Madeira.[11] The unexplored area left between the Gy-Paraná and Madeira on the west and the new river on the east can hardly harbor a larger river system, inasmuch as its longest axis measures about 400 miles as against an extension of the new river over 7½° of latitude, or over 500 miles. This does not even take into account the possibility that the tributaries, within this area, of the Gy-Paraná and of the new river, in view of the size of these two river systems, may approach each other so closely (the mean distance between the Gy-Paraná and the new river is 120-150 miles) as not to allow of the development of an inter-

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[8] *e. g.:* Maps of the states of Amazonas and Matto Grosso, on the scale of 1:6,200,000 approximately, constituting Pls. III and XXIII, respectively, of the "Atlas do Imperio do Brazil . . . organisado per Candido Mendes de Almeida," Rio de Janeiro, 1868; with bibliography in the text on pp. 10-11 and 30-32.

Carta do Imperio do Brasil. Organizada pela Commisão da Carta Geral sob a presidencie do General Henrique de Beaurepaire Rohan, com a coadjuvação do Exmo. Sñr. Barão Da Ponte Ribeiro. 1:3,710,220. 1875.

Mappa Geral da Republica dos Estados Unidos do Brasil. Publicado por occasião da Exposição Nacional de 1908 por ordem do Exmo. Sñr. Ministro da Industria, Viação e Obras Públicas, Dr. Miguel Calmon Du Pin e Almeida. 1:5,000,000.

Mappa da Viação Ferrea do Brazil e suas ligações com as rêdes ferreas de Bolivia, Perú, e Republicas do Prata, de accordo com os ultimos documentos e mappas geographicos em 1911. Organisado pelo Engenheiro Emilio Schnoor para a Companhia E. F. Victoria à Minas. 1:5,000,000.

[9] F. Schrader in the bibliographical notice, dated 1894, accompanying Sheet 84 (Amérique du Sud: Flle. N. E., 1:6,000,000) of the "Atlas Universel de Géographie," Hachette et Cie., Paris.

[10] By W. Chandless, in 1868: see his "Notes on the Rivers Maué-assú, Abacaxis, and Canumá," with map, 1:1,000,000, *Journ. Roy. Geogr. Soc.*, Vol. 40, 1870, pp. 419-432.

[11] Previously the Gy-Paraná was so to be considered—a status that only dated, however, from Col. Rondon's expedition of 1909. The Mamoré, Guaporé, and Beni are not tributaries, but source-streams of the Madeira.

vening stream of any proportion. Between the new river and the Tapajoz this contingency seems more possible, if alone the size of the intervening area be considered, which is about 550 by 180 miles. This includes the drainage area of the Abacaxis; but according to Chandless's account it is highly improbable that this river should take its source as far south as the upland of Matto Grosso, inasmuch as at the mouth of the Arapady, in lat. 6°12′—as far as Chandless ascended—, it was a very small stream with the boughs of the trees on its banks joining overhead.[12] The Canumá, because of its greater volume, might more easily drain the intervening region: indeed it is this river which, on the majority of recent maps, is represented as the most important drainage channel between the Madeira and the Tapajoz, a fact which led one of Col. Roosevelt's critics to suggest that he had descended this river. But even should it, when explored, prove to be longer than the new river (although indicated on these maps as rising as far south as 9° S., it has never been surveyed above the highest point attained by Chandless in 1868, at the junction, in 5°17′, with the Secundury, by which name the main stream is known above this point), it might be argued that the Canumá is not a tributary of the Madeira, inasmuch as it empties only into a *furo*, a backwater, which connects the Madeira with the Amazon. To summarize, therefore: the Roosevelt-Rondon expedition is the first, since Chandless, to give us any definite knowledge as to the hydrography of the area between the Gy-Paraná-Madeira and the Tapajoz, and it seems probable that the newly discovered river is the major drainage artery of that region. Incidentally the expedition has shown that the drainage divide designated "Cordilheira do Norte" on recent maps, which was supposed to extend from the Serra dos Parecis in 60⅓° W. north-northeast between the headwaters of the Gy-Paraná and the Canumá on the one hand and the Tapajoz on the other, and whose existence made other premature critics skeptical as to the route of the party, lies farther east and forms the divide between the headwaters of the new river and the Juruena.

A question of geographical interest connected with the expedition is the location of the lowest rapids on the new river. The report of the Col. Roosevelt's lecture in Washington seems to indicate that these lie in 10°45′ S., although it is not quite clear whether this position refers only to the end of the especially turbulent stretch of the river, which it took forty-two days to descend, or whether it indicates the last of all the rapids. The point is of interest, because, wherever these lowest rapids may lie, they represent a natural boundary. The route of the expedition led through two of the major natural regions of South America, the Brazilian Highlands and the Amazon Lowlands. The Brazilian Highlands, which occupy the whole eastern part of the continent to the east of the Amazon and Paraná-Paraguay lowlands, are an upland area composed of geologically ancient rocks whose varying degree of hardness has given rise to numerous rapids in the rivers which flow over them. On the contrary, the Amazon Lowland is a vast depression whose extremely low gradient (300 ft. in 2,500 miles) makes for the development of quiet, sluggish rivers. The boundary between these two regions is indicated by the final falls and rapids which occur on the southern tributaries of the Amazon where they flow over the margin of the upland into the lowland. On the lower tributaries these rapids lie near their mouths, but, as one proceeds to the west, they lie increasingly farther upstream. Thus, on the Xingú they lie in 3° S.; on the Tocan-

[12] *op. cit.*, p. 423.

tins, in 4°; on the Tapajoz, in 4½°; on the Maué-assú, in 5°; on the Canumá, probably in 6°; while on the Madeira they are in 8⅗° S. If on the new river they should lie in 10¾° S. this would indicate an embayment of considerable magnitude in the Amazon Lowland extending into the Brazilian Highlands at this point.

For all other results of geographical interest we must await the reports of the various members of the expedition. Col. Roosevelt's narrative in *Scribner's Magazine* will probably, as it progresses, furnish additional details, as may his lecture before the Royal Geographical Society in London on June 16. The matter of greatest moment, of course, is a map of the new river: and it is to be hoped that one will soon be published on the basis of Lieut. Lyra's observations. The Serviço Geologico e Mineralogico do Brasil will probably publish Dr. de Oliveira's notes on the geology of the region he traversed—from a geographical standpoint it might be regretted that he was unable to accompany the party which descended the new river—; and botanical results may be forthcoming from Senhor Hoehne. The zoological results of the expedition will doubtless prove to be particularly valuable in view of the fact that the study of faunal life was one of its main objects. Geographically they will probably be of more than usual interest, as, in keeping with Col. Roosevelt's known views on the methodology of natural history, they may be expected to lay stress on the ecological rather than on the taxonomic phase of the subject. The Roosevelt-Rondon expedition has thus, it will be seen, made valuable contributions to our knowledge of a little known section of the earth's surface. Aside from their interest in the expedition as bearing upon their field of work, geographers, above all, can appreciate Col. Roosevelt's feeling of gratification at having been able to participate in original exploration—"a chance," to use his own words, "that from now on, in the present state of the world's geography, can only come to a limited number of men." W. L. G. J.

LOSS OF THE KARLUK AND ESCAPE OF THE EXPEDITION TO WRANGELL ISLAND

The New York Times, on June 1, printed a long despatch from Captain Robert A. Bartlett, Commander of the *Karluk*, dated St. Michael, Alaska, May 31, giving the remarkable particulars of the *Karluk's* drift to the west for 110 days when she was crushed in the ice on January 11, 1914. A large quantity of supplies of all kinds had been placed on the ice, and the entire party reached Wrangell Island over the ice, with food resources for eighty-six days, on Feb. 13. The leadings facts are here condensed from *The Times's* account, with some explanatory comment.

Stefansson left the *Karluk* to hunt on shore on September 20, last year. It was thought that the vessel was frozen in for the winter. She was then about 15 miles north of the mouth of the Colville River. On September 21, a fierce gale from the east came up and, two days later, the ice which held the *Karluk* began to drift westward; and on September 25, Bartlett from the masthead caught a glimpse of Cape Halkett.[1] The vessel was drifting in an ice floe about two miles square. On September 26, the wind veered to the northwest. All leads closed between the ship and shore and the *Karluk* was for three days becalmed within six miles of Tangent Point.[2]

Preparations were begun to leave the ship if necessary. But on September 29, the wind changed to the northeast and the westerly drift was resumed among many grounded icebergs. On October 6, the vessel was twenty-five miles off-shore and drifting rapidly north beyond the 20 fathom line. The next day the *Karluk* was unmistakably north of the continental shelf, probably near the 72nd parallel. On October 11, bottom was found in mud and sand at 6,000 feet, or in oceanic depths.[3] On October 12, starfish and other species of sea life, hitherto unknown in the Arctic, were brought up from depths of about 7,000 feet. Captain Bartlett continues:

"We continued drifting northwest until October 22 when the nearest point should have been Keenan Land about 20 miles south of our position." For several days men with glasses sought land from the crow's nest without finding it.[4]

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1 Cape Halkett is about sixty statute miles northwest of the mouth of the Colville.

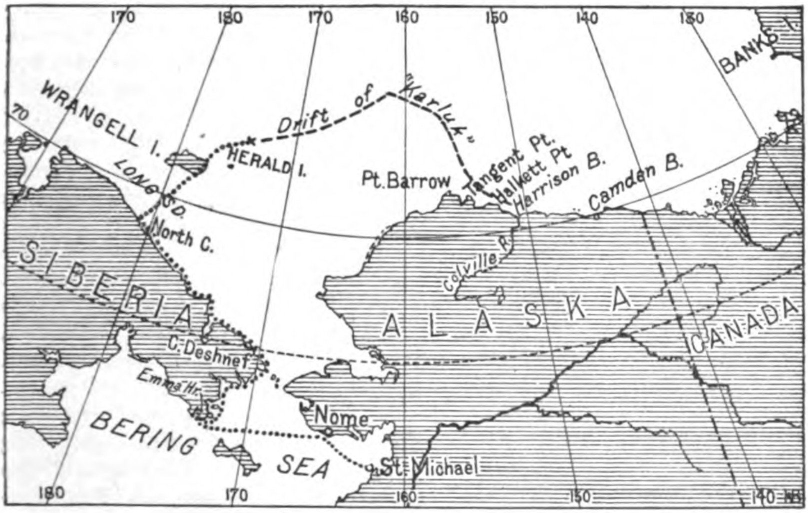
2 Approximately thirty miles southeast of Point Barrow. The closing of the leads, with more or less shattered ice, would make passage to land very difficult.

3 In the spring of 1907 the Mikkelsen-Leffingwell Expedition sounded to depths of 620 feet without touching bottom, between 71° and 72° N. and 148° and 150° E. The party was plainly north of the continental shelf but the shortness of the sounding line made it impossible to obtain precise depths (*Bull.*, Vol. 39, 1907, pp. 607-620). These soundings and those of Bartlett, some 4° further west, show that the continental shelf is narrow along this part of Alaska's coast with the strong probability that this condition prevails along the entire coast.

4 This statement cannot be reconciled with what is conjectured as to the position of Keenan Land, if it really exists. The discrepancy may be due to imperfect telegraphic transmission. Bartlett reports, thus far, an almost invariable drift to the west. He says that, on October 7, his position was 154° 5′ W. But on October 22 "after continued drifting northwest, Keenan Land should have been twenty miles south of our position." Keenan Land is placed on the charts hypothetically in about 146-147° W. Long. The late Marcus Baker said that the position

On November 1, Bartlett reports shallow water again at 100 fathoms. On November 5 he placed on the ice 250 sacks of coal, 100 cases of biscuit and other articles that would be needed after leaving the ship. The party shot their first bear on November 10. Next day the sun disappeared, the water was calm but the prevailing easterly winds kept the *Karluk* steadily moving westward. No current was observed and the ice movements seemed to be influenced only by winds. In his opinion, the prevailing winter winds in that region are from northeast to east. He continues:

"The theory of drifting across the Pole is questionable. Our drift carried the ship to the point where the *Jeannette* began her drift. The *Jeannette*, if not lost, probably would have taken the course of the *Fram*. It is possible that there is adjoining land in an unexplored region."[5]



Drift of the *Karluk* and Captain Bartlett's route.

Bartlett found much animal life in lat. 73°, long. 162° E. approximately. This was the most northern point reached. The date was November 15. Soundings here showed 288 feet. Later in the month the Eskimos caught five white foxes and the dredge brought up eleven species of animal life. On November 24, twilight was still strong enough to permit reading the figures on the transit without the aid of a lantern. The drift continued south and southwest until December 15, when more easterly winds took the ship west-

of Captain Keenan's ship, when he says he saw land, was between Harrison and Camden Bays. Captain Keenan reported that he saw this land in the seventies when in command of the whaling bark *Stamboul*. Land, he said, was distinctly seen by him to the north, and all the men of the crew saw it; but as he was not on a voyage of discovery and no whales were in sight he was obliged to go south in search of them (*Bull.*, Vol. 39, 1907, p. 227).

[5] It may be said, however, that one of the buoys set adrift by Bryant and Melville, to the north of northwest Alaska, was picked up on the north coast of Iceland. Its most probable route was conjectured to be northward across the polar area till it got into the East Greenland south-flowing current which carried it to Iceland.

ward. On New Year's Eve, 1913, the *Karluk* was sixty miles north by east of Herald Island.

Great ice pressure was observed on January 2. At 3 A. M., on January 10, the men were awakened by a sharp report like that of a gun, and the ship was quivering. The ice had opened from the stem of the vessel in a westerly direction for about 300 feet where the crack closed. At 7.30 P. M. the wind increased to a gale with blinding snow, a corner of the ice sheet struck the ship abreast of the engine room, breaking some of her timber planks, and water began to pour into the engine room. Pemmican, milk, clothing, ammunition, arms, oil, etc., sewn in canvas, were immediately placed on the ice. In spite of the darkness, the men did as much in an hour as they would ordinarily in six hours. Ten thousand pounds of supplies were hauled on sledges to the solid ice pan, one hundred yards away, where a house made of boxes and covered with sails and other articles had been previously placed. An Eskimo woman with her baby was sent to the house to make a fire in the stove and prepare for the arrival of the men. Practically everything could have been saved; but as pemmican, biscuit, tea and milk were sufficient for rations the delicacies were left on the ship.

At 10.45 P. M. there were eleven feet of water in the engine room. By midnight, all supplies had been placed on solid ice. At that time Bartlett sent the men to the shelter house but remained himself on the ship until she sank, on Jan. 11, at 4.30 P. M. in 38 fathoms of water. A snow house was also built beside the boxhouse. All mattresses had been saved, there was a stove in each house, plenty of coal and good food was regularly provided. This place was called Camp Shipwreck. It was decided, as soon as the sun returned, to begin carrying the supplies to land. About 60 miles away, south by west, there appeared to be land which the men thought was Wrangell Island. Mate Anderson, second mate Barker and two sailors were sent ahead on Jan. 20 with three months' supplies to look for game and make a trail to facilitate the removal of the supplies towards shore. Everybody was kept busy making skin clothes. Mamen (the assistant geographer), who, with Eskimos, 20 dogs and three sledges, was sent on to support mates Anderson and Barker, returned in three days and said they had accompanied the mates to within three miles of land. On January 31, it proved to be Herald Island and could not be reached on account of open water. Wrangell Island, thirty-eight miles from Herald Island, was not sighted.

Early in February, Mamen, Dr. A. Forbes Mackay, James Murray, the oceanographer, and Henri Beauchat, the anthropologist, set out for land, hauling sledges and following the trail of the supporting party. Supplies were also advanced along the trail. The whole party reached Wrangell Island[6] on

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[6] For over a century before Wrangell Island was discovered it was reported to exist on the strength of Chukchee reports. Wrangell, the famous explorer of north Siberian waters, vainly looked for it in 1824. Nordenskiöld did not see it when he made the northeast passage. It was at last discovered by an American whaler, Thomas Long, who sailed along its south coast, August 14-16, 1867, discovering its southeastern cape and its western extremity. Other whalers also saw it. The great geographer Petermann, who believed that Greenland was a continent crossing the Pole and probably approaching Siberia, advanced the idea that Wrangell Island was the extremity of Greenland towards Asia. The theory of a continent, however, was exploded by Commander De Long, on the Jeanette Expedition, when he entered the pack ice near Herald Island expecting to reach and winter at Wrangell Island. His vessel, however, never escaped the pack but drifted almost steadily westward, passing to the north and in sight of Wrangell Island which thus shrank to the dimensions of a small island.

Feb. 13, landing on an ice spit. Bartlett's party were the first to set foot on this land. Plenty of driftwood was found for fuel. The party then had eighty-six days provisions for every person and three men were sent back to Camp Shipwreck for additional supplies.

Bartlett left Wrangell Island on Feb. 18 for the Siberian shore, one hundred miles away, with Perry and Eskimos, a sledge and seven dogs. His purpose was to secure means of sending relief to his party. He was much delayed in crossing Long Sound (named after Thomas Long) by heavy gales and moving ice. Three of his dogs were lost on the way. He was kindly treated by the natives along the Siberian coast to Cape Deshnef, where he met Baron Kleist, who invited the men to his house at Emma Harbor, Bering Sea, where the chances were best that they would meet a whaler. Emma Harbor was reached in the middle of May, when Captain Petersen of the whaler *Herman* relinquished his whaling and trading enterprise and started with Bartlett and his men for the American coast. Ice prevented them from landing at Nome and they therefore went on to St. Michael. Bartlett had been only three months on his long journey to the Bering Sea coast.

The Canadian Government is taking prompt measures to send relief to the men whom Bartlett left on Wrangell Island. On June 9, Captain Cochran, of the U. S. revenue cutter *Bear*, at St. Michael, Alaska, was instructed by the Assistant Secretary of the Department of the Treasury to endeavor to rescue the *Karluk's* party.

The *Karluk's* drift measured, in a straight line from her starting point off the mouth of Colville River to some sixty miles north by east of Herald Island where she sank, about 590 statute miles. Only to the east of Point Barrow did her course diverge a little to the south of this line; but there were a number of divergencies to the north of it, the greatest of which was about 70 miles north of the line about midway of the drift. The divergencies from a straight course probably increased the length of her journey by at least 200 miles, making the total drift about 800 miles, or an average daily drift of over 7 miles.

The drift of the *Karluk*, the ice journey to Wrangell Island dragging tons of supplies, and Bartlett's long tramp from that island through northeastern Siberia will have a conspicuous place in the annals of Arctic exploration.

NOTES ON THE DESCRIPTION OF LAND FORMS—XII

Physiography in New Zealand.

THE PHYSIOGRAPHY OF THE MIDDLE CLARENCE VALLEY, NEW ZEALAND. By C. A. Cotton, Victoria College, Wellington, N. Z. *Geogr. Journ.*, Vol. 42, 1913, pp. 225-246.

The geographical factor of distance has been recognized as of value in anthropogeography, inasmuch as its increase tends to weaken the influence of home-country traditions in a colony. The socialistic legislation of New Zealand, strikingly unlike the more conservative legislation of Great Britain, is a well known instance of the operation of the distance factor in governmental matters: the article cited above is an instance of it in geographical matters.

The colonial author of this exceptionally lucid paper discards traditional and conventional British methods and makes conscious application of a comparatively new, systematic and explanatory method in his physiographic description. First comes a page of helpful introduction; next follow two pages of "Brief Description," in which the essence of the story is concisely

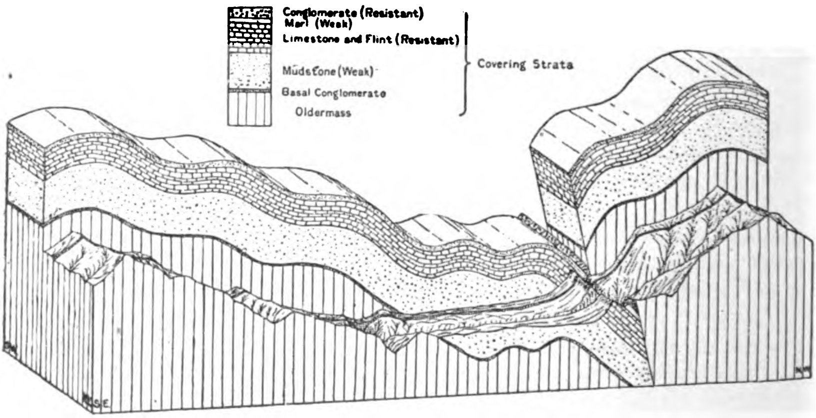

FIG. 1—Diagram illustrating the type of structure and sculpture in the Middle Clarence Valley. (*Geographical Journal*, Vol. 42, 1913, No. 3, p. 227.)

told; fourteen pages are then given to a fuller treatment of six topics that were lightly touched in the "Brief Description"; and four pages of a geological appendix close the article. The illustrations include a location map, an excellent block diagram (Fig. 1), six effective outline sketches, and five photographs. Evidently the needs of the reader have received due consideration by the writer, and, as a result, his work quickly gains due recognition from the reader. When a paper follows a systematic order, as this one does, it gives the impression of a completed story; and a paper that gives the impression of completeness is probably based on a study that was carried through with thoroughness. When a paper possesses, as this one does, the invaluable quality of lucidity, it is highly probable that the investigation on which it was based possessed the equally desirable quality of accuracy.

One here learns that, according to this author, in a great compound mass, consisting of a disordered and worn down "oldermass" originally buried

beneath some 12,000 feet of "covering strata," "two anticlinoria are represented with an intermediate synclinorium" trending northeast-southwest, the northwestern limb of the synclinorium being "replaced by a reversed fault of enormous throw." The anticlinoria no longer preserve their cover, but are deeply carved by normal processes into two one-cycle mountain ranges of strong relief, known as the inland (northwestern) and the seaward (southeastern) Kaikoura ranges. Between them is a long and broad consequent valley-lowland—the Middle Clarence valley, worn down on the weak covering strata of the faulted synclinorium, except that an unconsumed monoclinal ridge of resistant limestone with northwestward dip survives near the fault line at the base of the inland range; but as a result of relatively recent rejuvenation by regional uplift, of which the headwater streams in the mountains do not yet take notice, the main rivers are now entrenched in narrow valleys beneath the remnants of the former lowland floor, save that Clarence river itself no longer flows in the belt of weak covering strata, but is incised in the oldermass along the border of the seaward range, seemingly superposed from a former extension of the cover. Some of the mountain streams "must now be superposed consequents"; others which descend the mountains obliquely instead of directly are perhaps guided by weak belts in the oldermass, and "may be classified provisionally as subsequents."

Special attention should be directed to certain excellent features of Cotton's article. It makes free use, without stopping to explain them, of such systematic terms and phrases as consequent, subsequent, superimposed, antecedent, grade, rejuvenation, normal erosion agencies, one-cycle mountains and elbow of capture, as if its pages were written for mature geographers of some reasonable proficiency in their science. The sequence of parts is carefully arranged, so that the reader advances easily from large features to detailed features. "The account given of the geological structure is limited to the minimum required in explaining the relief"; all geological formation names are relegated to an appendix. The "Brief Description" contains no local, unexplained place-names as guides to the location of physiographic features; only four place names are there introduced and they are located with respect to the physiographic features. On the other hand, it may be questioned whether the historic order of presentation, not followed in the above abstract, is best for the presentation of a visible product of change, not a past process of change; whether the historic style, with its prevalent use of the past tense, is most satisfactory for the description of present forms; whether certain phrases might not be changed to advantage from descriptive explanations to explanatory descriptions; and whether a few more dimensions, such as miles of length and breadth, and feet of height, should not have been added to the "Brief Description." But these are small matters, or rather they are niceties, almost too delicate for mention in the discussion of any articles but the best.

The Lakes of the Balkan Peninsula.

L'ANCIEN LAC ÉGÉEN. By J. Cvijić. *Ann. de Géogr.*, Vol. 20, 1911, pp. 233-259.

This geological article by the professor of geography in the University of Belgrade is largely concerned with the study, which he has most persistently and enterprisingly carried on, of an extensive Pliocene lake that occupied the southern part of the Balkan peninsula, inland from Salonika, as well as part of the later-formed Aegean Sea. The article was probably accepted for publication in a geographical journal because the reconstitution of the extinct lake is based in large measure on physiographic evidence, as well as because the history of the extinct lake contains much excellent and novel physiographic information. The article is here reviewed in order to examine the manner in which its physiographic elements are stated and applied.

The region under discussion contains a good number of existing lakes, nearly a score being shown on one of the maps accompanying the article, some with outlets, some without, but all occupying local basins in what was once the bottom of the extensive and irregular Pliocene lake, to which the name,

Aegean, is given. The local basins are explained at the outset as "tectonic depressions of recent date," often determined by down-faulted troughs (p. 234). This statement is physiographically incomplete, because it gives no idea as to the character of the surface before it was deformed and faulted; hence the reader is here left in uncertainty as to the nature of the tectonic basins, unless he happens to know beforehand the Pliocene or pre-Pliocene topography of the region. Attention is called to the incompleteness of the statement, because it is an example of a frequently employed but essentially imperfect method of description, which neglects an important three-fold principle of physiographic presentation, namely:—Whenever mention is made of a crustal movement as a factor in the explanatory description of the existing form of a land surface, the form that the surface had before the movement took place and the changes that it has suffered since the movement, as well as a sufficient account of the movement itself, should be included in the statement; in other words, when a cycle of erosion is interrupted by a crustal movement that places the land mass under consideration in a new attitude with respect to base-level and thus introduces a new cycle of erosion, the stage of development reached in the first cycle when it was interrupted and the stage reached in the second cycle since it was introduced, as well as the interrupting movement, should all be stated.

For example, if a certain coastal district is said to owe its present shoreline to a movement of depression, it is essential to know the form that the district had before the depression took place, as well as the estimated amount of depression, in order to conceive the new shoreline in its initial stage; and then to know the changes that have since been produced by river and marine action, in order to conceive the present shoreline. Again, if a district is described as traversed by a fault, it is essential in a physiographic description to know the pre-faulting form of the surface—unless it is all destroyed—and the changes since faulting, as well as the direct effects of the fault itself. In both cases it is, in the present writer's opinion, highly desirable to state the pre-depression or the pre-faulting forms of the districts concerned in terms of the structure of their rock mass, of the agencies that have worked on it, and of the stage reached by the agencies in their work.

In the present case the changes since deformation may be inferred to be small, because the deformation is said to be recent; but these post-deformational changes may not be immediately essential, because the author's object is apparently to indicate the form of his district soon after the deformation took place; yet on a later page (253) explicit mention is made of significant erosional changes produced on the deformed surface before its occupation by the Pliocene lake. The very brief statement regarding the down-faulted troughs and the absence of statement regarding the dimensions of the fault scarps that bound the troughs and regarding the post-faulting changes in the scarps are regrettable, but the omission of the pre-deformational form is a still more serious deficiency in an explanatory description. The deficiency is partly made up on a later page. where it is said that the basins are sunk in a pre-existent "plate-forme" (249); further, that detached fragments of large pre-deformational valleys are still recognizable in the uplands between the troughs; and that domes and other reliefs appear in the basin floors (250-252). This is good as far as it goes; it evidently suggests that domes and other reliefs are to be inferred upon the uplands also, although they are not directly mentioned here, perhaps because they are not directly related to the lake problem. Finally, at the very end of the article (258, 259), a brief statement is made regarding the form of the highlands. Why these illuminating details are distributed through later pages instead of being concisely and pertinently stated at the beginning, and why no brief mention of structure is included when the pre-lacustrine platform is described, is not readily understood. The author presumably had some reason for the distributed arrangement, but the reason is not apparent to the reader, whose mental picture of the region must float vaguely while he reads the body of the article, unless he impatiently looks ahead for help, as some readers do. Would it not be well, in such cases as this, for the author to serve the reader's needs more directly, by describing the fundamental land-forms at the beginning?

The maximum extension of the Aegean Lake is inferred in part from its fresh-water sediments which sometimes spread over the lower uplands, but which, aided by the sediments of the later dwindling lakes, are heavier on the basin floors; and in part from its built shore-line terraces and its abraded benches, of which the highest two have altitudes of 740-800 and of 670-680 meters. The highest terraces and benches, as well as the lower terraces formed during the dwindling of the extensive lake, are not easily apprehended as geographical features from the statements of the text; perhaps the author did not intend that they should be. But inasmuch as they are mentioned, the reader naturally strives to conceive their appearance; and his difficulty is, as before, that the three-fold principle of physiographic presentation, essential for a clear account of such features, is again neglected. First, the initial forms of the lake shores are so imperfectly stated that they cannot be understood; second, the stages reached in the development of the built terraces and the cut benches are not announced, and nothing is told of deltas in connection with the terraces, or of cliffs at the back of the benches, although the benches are said to transect the rock structure and to extend over "vast surfaces" (258); and third, the amount of post-lacustrine dissection suffered by these features is hardly mentioned, although special account is given of certain epigenetic streams which often follow meandering gorges in the resistant underrocks into which they have cut down from the consequent courses assumed on the lacustrine sediments, as the lake waters fell to lower and lower levels. Whether the broad benches are properly interpreted as due to lacustrine abrasion is not here discussed; but it may be noted that corresponding surfaces farther north are said by Cvijić to have been described as normal peneplains by de Martonne.

In so far as the object of the paper is geological, geographical readers must feel grateful to its author for incidentally providing them with so much physiographic material, even though they may regret that the material is not more systematically and effectively presented, as it might easily have been. In so far as the object of the paper is geographical, as might be inferred to be the case from its preparation by a noted professor of geography and its publication in an excellent geographical journal, its readers must more seriously regret that the present consequences of past crustal deformation and temporary lacustrine occupation are not set forth in such a manner that the resulting landscape of to-day can be more definitely and completely pictured. Whether this result could be secured by the adoption of the three-fold scheme of presentation, above indicated, can be best determined by comparative experiment. Let a given district be described first in the way adopted by Cvijić, and next according to the three-fold scheme; and then test the relative success of the two descriptions by reading them to some innocent but competent listener, who is uninformed as to the issue at stake. Experiment of this kind is strongly recommended to young geographers, whose habits in writing geographical descriptions are not yet formed.

W. M. Davis.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

The Daly Medal presented to Prof. Dr. Albrecht Penck. On the afternoon of May 13, the Daly Medal for Geographical Research, which had been awarded by the Council to Prof. Dr. Penck, Professor of Geography at the University of Berlin, was formally presented to him, in behalf of the American Geographical Society, by the Hon. James W. Gerard, Ambassador of the United States to Germany, at the Embassy in Berlin. A number of Americans were present, including the staff of the Embassy. The Amerika Institut was represented by Dr. Drechsler and the Amerikanische Handelskammer by President Wolff and Professor Atwood.

Among the distinguished Germans in attendance were the following representatives of the University of Berlin: Prof. Dr. Planck, Rector of the University, Prof. Dr. Max Sering, Dr. A. Rühl, Dr. A. Merz, Dr. Walther Behrmann, and Prof. Dr. Wilhelm Foerster.

The Berlin Geographical Society was represented by Prof. Dr. Gustav Hellmann, President, General von Beseler, Vice-President, Col. Georg Kollm, Secretary General, Prof. Otto Baschin, and Prof. Dr. G. Wegener, Secretaries, and Prof. Otto Behre, Treasurer.

In presenting the medal to Professor Penck, Ambassador Gerard said that his pleasure in placing the Daly Medal of the American Geographical Society in the hands of Prof. Penck was enhanced by the fact that the recipient of the honor had not only made distinguished contributions to geographical science and to knowledge of the geography of Europe but had also, by his field studies and writings, enriched the geographical literature relating to North America.

On receiving the medal, Prof. Penck said that at the outset of his scientific career, his attention had been called to the West, as a region of vast scientific opportunities, by no less an authority than the great geographer, Baron von Richthofen. He, who was now receiving this honor, first visited America in 1897. He returned to it in 1904; and in 1908-1909 he traversed the United States in its whole extent from Maine to California, and from Florida to Washington. It was also his privilege to teach in Columbia University and to witness the growing impulse of geographical science in North America. The medal which the American Geographical Society had now conferred upon him again recalled to his thought that science knows no bounds; and with all the greater pleasure, therefore, he received this honor.

After the presentation the company enjoyed, for some time, the hospitality of Ambassador and Mrs. Gerard.

NORTH AMERICA

A Geological Guide Book for the Exposition in San Francisco. N. H. Darton, of the United States Geological Survey, will spend the summer in the southwest obtaining data for a guide book of the geological features along the Santa Fé railroad from Kansas City to Los Angeles, with side trip to the Grand Canyon. This guide is to be published as a *Bulletin* of the Survey and is intended primarily for the use of travelers to the Panama Exposition in San Francisco in 1915. It will include maps showing the geology and topography in a zone about twenty-five miles wide on a scale of 1:500,000, for which much new field work is required. Many very instructive features of geography, physiography, and geology are presented along this most interesting route and it is believed that a description of them will be of interest to a large number of persons. Brief accounts will also be given of notable scenic features, Indians, history, and local industries.

Surveys in Alaska. The U. S. Geological Survey has placed eleven survey parties in the field, this year, for the working season which continues from June through September.

J. W. Bailey and Theodore Chapin will explore the region tributary to the

Talkeetna River and connect their work with the survey of the Broad Pass region, last year. On returning, the party will survey the region between the headwaters of the Matanuska and Copper Rivers which has been recommended as a railroad route.

R. H. Sargent and Philip S. Smith, with five men and twenty horses, will explore the region between Lake Clark on the east and the Iditarod district on the west, a stretch of country over 100 miles wide which is almost unknown. They will follow a route suggested for a railroad into the Kuskokwim Basin.

A. G. Maddren will investigate the gold placer districts tributary to the lower Kuskokwim.

Stephen R. Capps and C. E. Giffin will carry geological and topographical surveys across the Skolai Pass into the White River Basin and thence to the international boundary. Mr. Capps will give special attention to the newly discovered gold district in the Chisana Basin.

F. H. Moffit and J. B. Mertie will complete the survey of the Kotsina copper bearing area, begun in 1912 but suspended, last year, on account of the delay in the appropriation. B. L. Johnson, with one assistant, will make a detailed geological survey of the Port Valdez gold and copper district.

To coordinate and correlate the various geological surveys in Alaska it is necessary to continue the studies of the general geology and mineral resources. Three geologists will engage in this work. George C. Martin, assisted by R. M. Overbeck, will continue his studies of the Mesozoic stratigraphy, visiting important localities in southeastern Alaska, in the Chitina Valley, and along the Yukon. H. M. Eakin will undertake supplementary investigations of the tin deposits of Alaska. He will examine some of the occurrences of tin in the York region of Seward Peninsula and in the Hot Springs district of the Tanana Valley. Mr. Eakin will also undertake studies of mineral deposits and mining development in the Nome, Fairbanks, and Juneau districts.

Alfred H. Brooks, the geologist in charge of the Alaska surveys and investigations, expects to leave for Alaska as soon as office work permits, probably about the middle of June. He will devote special attention to the problems of Quaternary geology, including the genesis and occurrence of placer deposits. He will visit the Iditarod and Fairbanks districts and, time permitting, the Nome district. Mr. Brooks will also join the Moffit party in the Kotsina district and the Johnson party in the Valdez district for brief periods. (*U. S. Geological Press Bull.*, May 2, 1914.)

The Carnegie off on Another Cruise. The non-magnetic yacht *Carnegie* left Brooklyn, on June 8, for a six-months' cruise in the North Atlantic Ocean in continuation of the magnetic survey of the oceans which is being carried out by the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. The vessel is commanded by Captain J. P. Ault, with Dr. H. N. W. Edwards second in command. She will call at Hammerfest, Norway, and Reykjavik, Iceland.

A Magnetic Expedition to Hudson Bay. A magnetic exploratory expedition will be sent this summer to Hudson Bay by the Department of Terrestrial Magnetism, under the leadership of W. J. Peters, assisted by D. W. Berky. The schooner *George B. Cluett*, of the Grenfell Association, has been chartered. She will leave Battle Harbor, Labrador, on July 1, and return about Oct. 1.

The Territory of New Quebec. That part of Canada lying north of the Province of Quebec and west of the northeast coast region known as Labrador and under the authority of Newfoundland, has long been known as the Territory of Ungava. The legislative assembly of the Province of Quebec has renamed it the Territory of New Quebec. It general features are well known. It is likely in time to develop some economic importance as the trees most favorably situated will supply a profitable lumber industry, and the fisheries in numerous lakes and rivers, when developed, are likely to be very valuable. The total population now is 14,300, made up of 8,800 white settlers, 2,000 Eskimos and 3,500 Indians.

The International Congress of Americanists. The first session of the 19th International Congress of Americanists will be held at Washington from Monday October 5 to Saturday October 10, 1914. The meetings will be held in the new building of the U. S. National Museum under the auspices of the Smithsonian Institution, the local universities and some of the scientific societies of the capital. The Americanists will visit New York on October 12 and in the afternoon they will visit the Hispanic Society of America and attend a reception tendered by the American Geographical Society at its house from 4 to 6 P. M.

SOUTH AMERICA

The Amazon Expedition of the University Museum, Philadelphia. This expedition left Philadelphia in March, 1913. A statement of its organization and purposes appeared in the *Bulletin* (Vol. 45, 1913, pp. 369-370). It was sent to the Amazon Valley to collect information relative to the aboriginal inhabitants and to explore the forests where primitive peoples still roam untouched by civilization. The June *Bulletin* (p. 441) contained information from Mr. G. B. Gordon, Director of the University of Pennsylvania Museum, that the expedition had reached Georgetown, Guiana, by way of the Corentyn River. Mr. Gordon has obliged the Society with the following summary of the work of the expedition up to the time it reached Georgetown. Until Nov. 8, 1913, the expedition worked in northern Brazil, ascending from the Amazon *via* the Rio Negro and the Rio Branco. From the latter the party ascended in canoes the Uraricoera, near the borders of Venezuela, where the mountainous nature of the country and the waterfalls stopped their progress. They proceeded, however, further than white men had gone before on this river and were in contact with three tribes not hitherto known to science. From the Uraricoera, the expedition traveled overland to Mt. Roraima, and thence across country into British Guiana and the headwaters of the Essequibo. A halt was made at Dananawa, the ranch of Mr. H. P. C. Melville, the only white resident in the southern Guianas and the government agent and protector of the Indians for the whole British territory. Here the expedition was joined by Mr. John Ogilvie, an experienced woodsman. With forty native carriers the expedition then started directly eastward into the unknown region of southern British Guiana lying along the Brazilian frontier. The party carried no provisions, but depended entirely on the wild game and vegetables of the country. On January 8, after passing the country of the Waiwai Indians, the expedition was with the Diows. On that date Dr. Farabee sent Dr. Church back over the route by which they had traveled to bring out collections that had been made up to that time. It was also necessary to reduce the party on account of the increasing scarcity of food as the expedition advanced. Dr. Church arrived at Manáos on March 15 and reported to the Museum. Nothing more was heard from Dr. Farabee until April 20 when a cable was received from him dated at Georgetown announcing his arrival there.

On May 9 a letter was received from him written at Barbados where he had gone to recuperate before starting on another journey into the interior. He said that the expedition continued to travel eastward from December 16 to April 1 through territory that had not been penetrated and was inhabited by tribes that had never seen white men. These natives had never seen such articles of civilization as matches or guns, salt or clothing. A halt was made with each tribe in order to study languages and customs and to make collections. The tribes visited after the Waiwai were the following: Parikutu, Waiwe, Chikena, Katawian, Toneyan, Diow, Kumayenas and Urukuanas. At this time the party consisted of two white men and four natives, for it was found that a larger party could not live on the country. The direction of the journey was at right angles to the watercourses and involved the crossing of one divide after another. As each river was reached canoes were built and the rivers explored up and down. The ammunition became low, but the Indians procured game and fish with their bows and arrows. Dr. Farabee hoped to find a river flowing east or southeast, but finding instead one which flowed northwards and being stricken with fever, he decided to build canoes and descend this river

which proved to be the Corentyn. The party thus arrived at Georgetown on April 19. The letter says that important collections have been sent to the Museum as a result of the trip.

An Expedition to Perú. A topographic party under the leadership of E. C. Erdis sailed for Peru on May 2 to prepare maps of a part of southern Peru including the Cordillera Vilcabamba and parts of the Apurimac and Urubamba basins. This region is one of the most inaccessible parts of the Andes and is very poorly mapped. The work of this party is preliminary to the mission of the main expedition which probably will not set out until early next year. Mr. Erdis and his men will make maps for the use of the scientific staff that is to follow. Dr. Hiram Bingham is Director of the expedition and Prof. Herbert E. Gregory is geologist. The expedition is going out under the joint auspices of Yale University and the National Geographic Society. It will spend about two years in the field. The study of the ancient ruins known to exist in this region and of the land areas that the former peoples of Peru occupied is the main purpose of the expedition. (*Science*, May 8, 1914, pp. 679-680).

ASIA

Stein's New Expedition. Sir Aurel Stein, on his new expedition to Central Asia, reached the neighborhood of Lop-nor in January last, after carrying out a part, at least, of his proposed winter campaign in the desert. Writing from Camp Miran, Lop-nor, on January 19, he reports that he had seen a good deal of the desert, partly by new routes, but had been obliged to move quickly in order to be in time in reaching a corner of the Tarim basin to which the explorer is drawn by a combination of geographical and archæological interests, and where work is possible only in the winter. He wrote from the site of the old Lop ''capital,'' where he had succeeded in recovering interesting remains, and was then busy with preparations for a move through the desert northeastward, with a view to pushing on into Kansu. Political conditions were still somewhat unsettled, but had not, so far, interfered with his work, though it was clear that the revolution in China had not changed things for the better in those parts. In spite of the advanced season and the severe cold, the triangulation along the Kuen Lun had been extended well to the south of Lop-nor. (*Geogr. Journ.*, Vol. 43, 1914, No. 4, p. 440.)

EUROPE

Descent into the Crater of Vesuvius. In December, last year, Mr. Storz made a descent into the crater of Vesuvius. He clambered down the crumbling crater edge to the opening into the depths on the south side. The wall enclosing this opening is steep on the south side but of gentler slope on the north side of the crater. The new opening, as is known, was formed on July 5, 1913. A short time after the enlargement of the opening the lava rose in it almost to the edge, then sank to about 300 feet below the edge. This was the position of the lava at the time Storz made his descent. Gaseous ebullitions were from time to time being violently expelled. Storz found that the temperature within the opening rose very rapidly. About thirty feet below the edge of the opening the temperature was about 334° C., at fifty feet, 483° and at 200 feet, 632°. Further temperature measurements could not be carried out because the thermometer was lost. As the iron cable used by Storz slipped easily into the opening its wall appears to be practically perpendicular for at least 200 feet from the top. (*Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1914, No. 3, pp. 226-227.)

A Periodical on Vulcanology. The *Scottish Geographical Magazine* comments on the first number of the *Zeitschrift für Vulkanologie* edited by Mr. Immanuel Friedlaender of Naples and devoted to problems connected with volcanoes and volcanic action. It is to appear at irregular intervals. Mr.

Friedlaender, in his preface, says he has been trying for some years to found an international volcanic institute at Naples but has met with financial and other difficulties. He has therefore established a private institute on a modest scale and is issuing the new journal in connection with it. The publication will contain both original contributions and summaries, abstracts, etc. The first number has several original papers, the English, German, Italian and French languages being represented. It contains a number of fine illustrations of Vesuvius and other volcanoes.

POLAR

Antarctic

An Anglo-Swedish Antarctic Expedition. *The Geographical Journal* (Vol. 43, 1914, No. 5, pp. 554-558) prints details of an Anglo-Swedish Antarctic Expedition which it is proposed shall leave Europe in August, 1915, for West Antarctica, to the south of South America. It is expected to establish headquarters in the northern part of West Antarctica. The first summer will be given to rearing the station but, if ice conditions permit, a trip will be made southward on the vessel to visit the depôts left by the Swedish Antarctic Expedition of 1901-1903 on Snowhill Island and to prepare for future sledge expeditions. For the rest, the winters will be chiefly utilized in studying the environs of the station and the spring and autumn will be devoted to sledge expeditions. During the summer the staff will be busily employed on scientific work upon the vessel. The committee has estimated the cost of a vessel and the initial erection of the station at about $20,000, most of which has been promised by two Swedish patrons. The annual expense of maintenance, if the cooperation of the whaling companies is realized in transporting plant and keeping the station in touch with the outer world, is estimated at about $15,000. Half of this amount the Swedish committee hope to obtain by a grant from the Swedish Parliament. The trustees of the British Museum have pledged an annual grant of $2,500 for five years, the Royal Society has granted $2,500 for the first year and England's share in the undertaking promises to equal that of Sweden. It is intended to divide all collections between English and Swedish museums and two places on the staff will be reserved for English scientists.

The expedition is expected to complete the work so admirably begun by Professor Otto Nordenskiöld in 1901-1903. The important discoveries of the Nordenskiöld Expedition showed that this tract of Antarctica is well worthy of thorough study and that science and the museums may be provided with much fresh material from the treasures discovered.

The whole region will be mapped in part from the vessel and in part by means of sledge expeditions in the summer on the land ice. Another great question which the expedition will endeavor to solve will be the connection between West Antarctica and the true Antarctic Continent. Filchner's German expedition hoped to solve this question but did not succeed; it is one of the objects of other expeditions that are now preparing for departure with their base at the south of Weddell Sea.

Arctic

The Amundsen Expedition to the Arctic Ocean Postponed till 1915. Captain Roald Amundsen proposed this summer to enter the ice of the Arctic Ocean starting from Point Barrow. To reach Point Barrow in time for his enterprise it was necessary for the expedition to leave San Francisco not later than early in July this year. His vessel, the *Fram,* went to Colon in September last expecting to be the first vessel to pass through the completed canal this year. While awaiting there the opening of the canal the date of that event was indefinitely postponed on account of the landslides in the Culebra Cut. Lieut. Nielsen, who was in charge of the *Fram,* was therefore instructed to sail for San Francisco *via* the Straits of Magellan on his way to Point Barrow. As the *Fram* is a slow sailer she was expected to be some months on

the way to San Francisco. On March 25 a telegram from Montevideo announced that the *Fram* had put into that port to go into dry dock for repairs and that one of the most useful members of the party, the first ice pilot, had died during the journey from Colon. Under these circumstances the *Fram* could not reach San Francisco by July and Captain Amundsen found it necessary to announce the postponement of his Arctic enterprise until next year. Cable orders were sent to the *Fram* to return to Norway where she will take on the supplies that were to have been sent by rail from New York to San Francisco. It is now intended that the *Fram* shall start early next year for San Francisco and the Arctic Ocean *via* the Panama Canal.

PERSONAL

Dr. L. A. Bauer, by request, repeated his lecture on the "General Magnetic Survey of the Earth" before the New York Academy of Sciences on April 30 and before the New York Electrical Society on May 25. This lecture was first given before the joint meeting of the American Geographical Society and the Association of American Geographers on April 3. Dr. Bauer also gave four lectures (May 4-7) on "The Earth's Magnetism," at Johns Hopkins University.

Professor Hiram Bingham of Yale University lectured before the New York Academy of Sciences on March 23d on "Recent Exploration in the Land of the Incas" with lantern views.

Professor Henry Cowles of the University of Chicago, retiring President of the Geographic Society of Chicago, gave an illustrated lecture before the Society on May 8 relating to his observations and experiences in guiding a party of distinguished plant geographers through the western United States in the summer of 1913. Among the places visited were the Colorado Rockies, Mt. Rainier, Crater Lake, the Yosemite, Salton Sea and the Santa Catalina Mountains of southern Arizona.

OBITUARY

EDUARD SUESS. Professor Suess died in Vienna on April 26. He was born in London on Aug. 20, 1831. His family removed, while he was a boy, to Prague and later to Vienna. He was Austria's most eminent man of science and one of the world's greatest geologists. In 1857 be began his career as a teacher, served ten years in the University of Vienna as associate professor, and was appointed in 1867 to the full professorship of geology, a post that he held for 34 years, retiring as Emeritus Professor in 1901. He numbered among his pupils Neumayr, Penck, and other distinguished scientists. In an obituary notice of Suess written for *Nature* (May 7, 1914) by one of his pupils, John W. Judd, the writer says that over sixty memoirs and books were published by Suess prior to 1875 and his researches ranged over every branch of geological science. In that year appeared his remarkable work "Die Entstehung der Alpen" which was followed five years later, by the first part of the still more famous "Antlitz der Erde." In this great work, which engaged him during twenty-five years, he undertook the enormous task of taking a comprehensive survey of all that had been accomplished in elucidating the geological structure of every part of the world; and he drew general conclusions from that survey. It was a monumental work of great merit, of small defects, and the influence it exerted was enormous. The book has taken its place among the great scientific classics. The great task of his life was completed in 1910 and his days since then have been happy and restful for it was only recently that he was attacked with the bronchial affection which terminated his life in his eighty-fourth year. He declined many offers of honors and titles but received the highest marks of appreciation from his fellow workers in science. He was president of the Austrian Academy of Sciences, member of the French Institute, and foreign member of the Royal Society from 1894.

ADOLPH FRANCIS BANDELIER. The death of Mr. Bandelier, at Seville on March 18, has robbed the world of a most brilliant and versatile historian and anthropologist. In learning and critical ability he was head and shoulders

above any man who has yet devoted himself to the study of Colonial Spain and of the native races and civilization which it embraced. He has left an imperishable stamp on American anthropology, and has set a standard for scholarship and research which should be an inspiration to the younger generation.

He was born in Berne in 1840, the son of a Swiss gentleman of old nobility who held high office in the little Bernese republic. In 1847 his father, disgusted with the overthrow of the old conservative party in his native state, emigrated to America and settled in the town of Highland, Illinois. There Adolph Bandelier grew up in simple surroundings which might seem to give little promise for a student. But with an indomitable energy and thirst for learning he fought his way, and like the young Schliemann mastered every obstacle in the path of his scientific education. In boyhood his favorite study was natural history, a little later he turned to mineralogy, geology and chemistry, then to meteorology, in which connection he published, after eleven years, an important series of studies of the aurora borealis.

In 1857 and again in 1867 he visited Europe, where he was well received in many circles and formed valuable connections for his scientific interests.

In 1873 Lewis H. Morgan, the famous anthropologist, made the acquaintance of Mr. Bandelier and this was destined to be the turning point in the latter's career. Morgan awoke his interest in archæology and ethnology, but the time had not yet come when Bandelier could take the field for practical work, and for several years he was obliged to be content with a book-study of the history of Mexico and Spanish America. During this time he published his two important monographs in the *Reports of the Peabody Museum*. These brought him into such prominence that in 1880 Morgan was able to offer him the command of a scientific expedition to work among the Pueblo Indians of New Mexico. It was the beginning of a career of ceaseless exploration and literary activity which continued for thirty-four years.

From 1880 to 1890 his principal work was published by the Archæological Institute of America, and a glance at the index of the Institute's *Reports and Papers* will show the range and extent of his studies during that time. He made journeys all over Mexico, New Mexico, and Arizona, at a time when traveling meant real exploration among savage tribes.

At the end of 1890 the Archæological Institute was obliged to close its work and Mr. Bandelier then turned his attention to a new field. He had long been interested in South America, and in 1892 Mr. Henry Villard sent him out to the west coast of South America, where he continued his researches and explorations, chiefly in Peru and Bolivia. During the next twelve years, in addition to making archæological surveys over a wide field, he formed large ethnographical and archæological collections which are now in the American Museum of Natural History at New York.

A picture of Bandelier's work at this time is given by Sir Martin Conway in his paper on the Bolivian Andes in the *Geographical Journal* of the Royal Geographical Society (Vol. 14, 1899, pp. 22-24), and a sketch of his life and activities up to the same date was written by his intimate friend Señor M. V. Ballivian for the *Oficina Nacional de Propaganda Geografica de La Paz.*

In 1904 he returned permanently to New York where he lived for the next eight years, often in ill health and with failing eyesight. In 1912 he had recovered a considerable measure of health, and passed the winter in Mexico City collecting material for a work already far advanced on the Documentary History of the Rio Grande Pueblos. It was to continue this that the Carnegie Institution sent him, last October, to Spain, where he began what promised to be a long course of research in the archives of Seville. That he should have been cut off in the midst of this important undertaking, while still in the fulness of his unsurpassed mental powers, is a misfortune for the world. We can only hope that his widow and devoted collaborator, Madame Bandelier, may be enabled to complete and put in order what he has left. Mr. Bandelier was a true man of science, fearless and sincere in criticism, tireless in construction and singularly unaware of his own eminence. The list of his principal writings in English is reserved for later publication. DAVID RANDALL-MACIVER.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch)

NORTH AMERICA

Drainage Changes in the Shenandoah Valley Region of Virginia. By Thomas L. Watson and Justus H. Cline. *Bull. Philosoph. Soc., Univ. of Virginia,* Scientific Series, Vol. I, 1913, No. 17, pp. 349-368. Charlottesville, Va.

One of the most interesting areas in America for the study of drainage modifications is included in the Appalachian Mountain belt of Maryland, Virginia and West Virginia. The present paper deals with the development of the Shenandoah, a typical subsequent stream, and its branches. It is shown that a series of southeastward flowing rivers crossed a low ridge of resistant rock through narrow water gaps. Subsequent branches of the larger transverse streams developed on a belt of weak rock on the upstream side of the ridge, capturing the headwaters of weaker neighboring streams and leaving wind gaps to mark their former paths across the ridge. Ultimately one subsequent branch (Shenandoah) of the master transverse stream (Potomac) succeeded in beheading its temporary rivals southward to the James. The altitude and size of the abandoned wind gaps through the ridge (Blue Ridge) enable the authors to reconstruct the former drainage at different epochs and to determine the relative size of some of the streams and the order of the successive captures. Numerous maps and photographs have been used to illustrate the discussion. Further account of drainage changes in this region is promised in a future paper.

The discussion of the early drainage history of the region is not convincing, because the authors do not seem to distinguish between the surface drainage due to the Appalachian folding and the drainage on the warped peneplain surface of much later date. Superposed streams are mistaken for antecedent throughout the paper, and the same rivers are called both consequent and antecedent. Even the later drainage history is in places open to question, for Ashby Gap, which is cut more deeply into the Blue Ridge than others which are given great prominence, is omitted from all the maps, and no account is taken of it in reconstructing the former drainage. One misses a statement of the comparative elevations of different wind gaps and other essential details of evidence, and must rest content with the authors' conclusions when he would like to have in addition the facts on which the conclusions are based. Future papers on this important region would also gain in clearness if all the local places to which physiographic descriptions are referred could be shown on the maps.

An Industrial History of the American People. By J. R. H. Moore. xiii and 496 pp. Ills., index. Macmillan Co., New York, 1913. $1.25. 7½ x 5.

The attempt is to present, for high school courses in history, a text-book which is practical, or as stated in the preface, "profitable." There seems no doubt that the interest of the boy or girl will be held by a book of this type much more effectively than by those histories which still give the impression that the political progress of the world's nations has been more often the result of the whims of personalities than the effect of natural causes. The discussions bring events "to earth" by finding their causes in the topography, soil, climate, location or some other natural basis.

The book is divided into thirteen chapters treating, in the main, nine subjects: Fisheries, Lumber, Fur Trade, The Labor Problem, Agriculture, Com-

merce and Finance, Colonial Government, The City Problem, and Manufacturing. Each subject is treated from the beginning of American history and brought to date. It is not always apparent that the principal subjects of any two chapters bear some relation to each other. The material ought to be more closely woven. The basic idea of the book is excellent and as more or less of a pioneer in the field it deserves full commendation.

Maps are conspicuous by their absence. The few modern maps are all very poorly drawn and lack in information that seems essential to an industrial history. The photographs are good and numerous but not closely associated with the text. The 491 pages constitute too large a text-book. In its present form it will probably be best adapted for a book of reference or supplementary reader. EUGENE VAN CLEEF.

The Immigration Problem. A Study of American Immigration Conditions and Needs. By Jeremiah W. Jenks and W. Jett Lauck. 3d edition, revised and enlarged. xxiii and 551 pp. Index. Funk & Wagnalls Co., New York, 1913. $1.75. 8 x 5½.

Upon the printing of the first edition, this work came into its own as the standard commentary upon the unwieldy library of the reports of the Immigration Commission. The present edition has been wholly revised, largely rewritten, and contains the results of the final coordination of tables given by the Commission. It will serve as a guide and compendium for those who wish to study the problem of immigration as set forth in the reports of the Commission; and to the student of the sociology of modern folk movement it will prove invaluable. WILLIAM CHURCHILL.

Game Protection and Propagation in America. A handbook of practical information for officials and others interested in the cause of conservation of wild life. By Henry Chase. v and 238 pp. J. B. Lippincott Co., Philadelphia, 1913. $1.25. 7½ x 5½.

A thorough treatment of this most important topic including the propagation of game fish and the pollution of fishing waters. The author does not think that more legislation is necessary but he favors greater strictness in the enforcement of the game laws, shorter open seasons, and large tracts reserved, as to game, with no open season. The fact that game protective associations are being formed all over the country he regards as an encouraging sign of the growing interest in the conservation of wild life.

Dry Land Farming. By Thomas Shaw. xxx and 460 pp. Ills., index. The Pioneer Co., St. Paul, Minn., 1911. $2. 8 x 5½.

The dry land area of the United States and Canada includes approximately not less than 500,000,000 acres. Nearly all of this land is unusually rich in the elements necessary for plant growth. These millions of acres may be put under cultivation with the certainty of reaping an abundant harvest, provided water is supplied by irrigation and dry farming is carried on in the correct manner. Methods employed in humid farming regions will not succeed in these dry regions, and it is the aim of the author to make this book a guide to success in the new science of dry farming.

Among the many subjects which Mr. Shaw considers, are the following: history of dry farming; soils; rainfall; soil moisture; plant growth; plowing; planting; cultivation; harvesting; crops, trees and fruits that may be grown successfully; rotation of crops; water supply for irrigation, and in fact, all topics having a bearing on the dry farming industry. The book is written in a clear, concise manner, and should be of value to all those interested in this subject. WILBUR GREELEY BURROUGHS.

The Vanishing Race. The Last Great Indian Council . . . and the Indians' Story of the Custer Fight. By Dr. J. K. Dixon. xviii and 222 pp. Ills. Doubleday, Page & Co., New York, 1913. $3.50. 10 x 7.

This handsome volume, "the concept of Rodman Wanamaker," forms a fitting setting for the attractive photogravures of Indian chiefs and scenes

from Mr. Wanamaker's camera. The introductory summary of Indian manners and customs, written by Dr. Dixon, follows rather the ideal pictures of Cooper's novels than the reality of Indian life as depicted by Schoolcraft and other Indian ethnologists. The personal narratives of the Indian chiefs gathered at the "last great Indian council in the valley of the Little Big Horn, Montana, in September, 1909," are of great interest. They make clear that before the coming of the White Man, Indian life was one of tribal forays and internecine strife, as was common among the savage Scotch and Irish clans. They corroborate what was already known about the Custer fight, that Reno's cowardice and disobedience of orders were responsible for the annihilation of Custer and his seven troops of the Seventh U. S. Cavalry. They also correct the common error that Sitting Bull was the Indian general, who outmanoeuvered Reno and overwhelmed Custer. Sitting Bull was the priest, the medicine man, whose incantations made the warriors invincible. Chief Gall was the strategist who won the day. DAVID H. BUEL.

SOUTH AMERICA

Argentinien, ein Land der Zukunft. Von General A. Arent. 3. Auflage. 250 pp. Maps, ills. Max Steinebach, München, 1913. Mk. 7.50. 9½ x 6½.

This badly printed volume adds little to our knowledge of the Argentine Republic, except as regards the army, where the author speaks with competence. The material of the army, the gaucho, he regards as superior to that of any European army, as physically vigorous, accustomed to a life like that of an army in campaign, and expert with horses. He has no good word for the handling and officering of this army. Officers are too numerous, 1500 above lieutenants to 7000 men in 1900. Economy is unknown and little progress is made toward efficiency. However, since 1906, twenty-five Argentine officers have been getting training in the Prussian army.

Gen. Arent regrets that the Germans do not emigrate more to the Argentine, instead of to Canada and the United States, where they are "lost" to Germany. He does not see what they can like in our land of corruption and lynch law! Has he not pointed out the dear land of the Argentine, and have not the Germans in America Teutonic intelligence enough to know when they are well off? MARK JEFFERSON.

En Argentine. De Buenos-Aires au Gran Chaco. Par Jules Huret. 529 pp. Index. De la Plata à la Cordillère des Andes. 546 pp. Map, index. Bibliothèque-Charpentier, Paris, 1912 & 1913. Fr. 3.50 each. 7½ x 5.

There is little excuse for ignorance about the Argentine Republic with books like these about. Huret wrote these chapters for *Le Figaro* and they are very brightly written, the best account of the Argentine people that I know, both newcomers and old creoles. English and German writers mostly fail of sympathy with the Argentines and this sympathy M. Huret has. Nor is it one-sided. It is France and above all Paris that in South America stands for culture. The French are *personæ gratæ* in the southern continent. None the less, perhaps, because the French have not been so forward as the English and Germans to see commercial opportunities in those countries. Huret tells how a French firm declined to send workmen out to Chile to set up an iron furnace because they "did not know the country" and a German firm got the contract; how the English borrowed money of French bankers at 4 per cent. to build railroads that have netted them 8 and 12 per cent. However, neither Germans nor English are much liked, precisely because of the excellent profits they have known how to get out of the country.

As to the impending displacement of the English by Germans in all large business undertakings out there, the present reviewer is getting a little skeptical. He was told it was imminent thirty years ago when he lived there, that the English could not possibly long maintain themselves against the competition of "cheap" Germans. The evidence of the process was plain enough

to see everywhere, but the fact remains that the English are still there and still strong there! The author is a skillful word painter and visited almost every corner of the republic. He relates the stories of innumerable immigrants in many provinces, some failing to make good and many thriving. It is very vivid, as for instance the banquet of the 300 one-time French peasants of Piguet to commemorate the twenty-fifth anniversary of their colony at thirty-five francs a plate! A thousand useful pages. MARK JEFFERSON.

AFRICA

The Conquest of the Desert. By William MacDonald. xii and 197 pp. Ills. T. Werner Laurie, Ltd., London, 1913. 7s. 6d. 8½ x 5½.

The author tells of the progress now making in the Cape of Good Hope and the Transvaal in reclaiming desert lands for tillage by means of dry farming and irrigation. One of his sketch maps shows considerable advance of settlers into the southwestern, south and southeastern parts of the Kalahari Desert due in part to irrigation possibilities offered by the Orange River and to dry farming. The author is enthusiastic over the prospects of developing even the most unattractive parts of the Union of South Africa by means of dry farming and afforestation. The Kalahari he says belongs to the dry farmer. The book is full of data concerning the development of the drier portions of the British territory. His long official association with the work he is promoting gives Mr. MacDonald unusual authority to speak on this topic.

Pemba, the Spice Island of Zanzibar. By J. E. E. Craster. 358 pp. Map, ills., index. T. Fisher Unwin, London, 1913. 12s. 6d. 9 x 6.

Zanzibar and the neighboring island Pemba supply seven-eighths of the world's crop of cloves and the Pemba crop is about three times as large as that of Zanzibar. It is surprising that so little has been known of the island that supplies most of the clove crop. Captain Craster was assigned by the Ordnance Survey to make a topographic survey of the island for the Zanzibar government. It was not an easy task, for Pemba (area, 300 sq. miles) lies low and is well wooded, conditions that emphasize the difficulties of a topographic survey.

The work began in May, 1911, and was completed in February, 1912. A sketch map shows the contours of the tortuous and deeply indented coast and the distribution of cloves, bush and mangrove. The book gives much information about the inhabitants, their condition and occupations. The clove crop varies greatly from year to year. In good seasons the clove pickers often let their other crops go to ruin in order that they may gather the whole of the more valuable clove harvest. The book contains a great deal of information somewhat diffusely and unsystematically presented after the manner of popular books. But it is our best source of reference for a renowned and important island.

Ostafrikanische Landwirtschaft. Reiseschilderungen von C. Hanisch, J. Schmidt und G. von Wallenberg Pachaly. 164 pp. Map, ills. *Arbeiten der Deutschen Landwirtschafts-Gesell.*, No. 230. Berlin, 1912. 9½ x 6½.

The three authors of this book describe their impressions of a visit to German East Africa under the auspices of the German Agricultural Society. Hanisch gives a diary of the trip, v. Wallenberg Pachaly records his hunting adventures, and Schmidt contributes a topical review of the most important tropical cultures of the colony. Cotton,—mostly the Egyptian varieties, upland, and Caravonica,—is grown in increasing quantities, but its culture cannot be said to have passed the experimental stage because neither the climate nor the soils of the country are as yet well enough known to allow the drawing of general conclusions from individual results or failures. Rubber has so far proved a paying investment. It is to be seen, however, whether it will be able to stand the competition of the East Asiatic product, which may be ex-

pected to arise within a few years. Hemp is the most encouraging culture; it is not particular about soils and can stand even long periods of drought. Coffee, most of which is grown in Usambara, was at first disappointing because the managers of the plantations who had been brought mostly from Java, Ceylon, and Brazil, introduced the methods of culture in vogue in their own countries regardless of the climatic differences between those countries and East Africa. After this mistake had been recognized, the production increased steadily in quantity and quality; especially the volcanic soils at the foot of Kilimanjaro and Meru (province of Moschi) are now producing an excellent coffee. Of the other products, copra and rice promise good returns in not too remote a future, while tobacco does not, except in the Kilimanjaro region. The most important cultures of the natives are millet, Indian corn, sweet potatoes, peanuts, and bananas.

The map illustrating the distribution of the tsetse fly deserves especial mention. The pictures contain many characteristic views of the landscape and vegetation. M. K. GENTHE.

Das neue Kongogebiet (Kamerun, Deutschkongo). Von F. Berthold Krüger. 65 pp. Ernst Marré's Verlag, Leipzig, [no date]. 9½ x 6.

Although this is the merest tract, its pages contain a very satisfactory amount of invaluable information concerning the Kamerun. Introducing his theme with a brief narrative of its discovery history the author presents, in the immediately following pages, a concise record of the land and its people so far as they condition the activities of new settlers. His chief end is to supply helpful hints which may prevent thoughtless adventurers from seeking to help failing fortunes by breaking new ground in the colony and which may equally serve to assist those who, after due consideration of all the arguments, decide to establish themselves in this new land of Germany. It is a very practical piece of writing and therefore of great value.

WILLIAM CHURCHILL.

Les Lois et l'Administration de la Rhodesia. Par Henri Rolin. xlvii and 532 pp. Maps, index. E. Bruylant, Brussels, 1913. Fr. 12. 10 x 6½.

The first two chapters contain a short biography and appreciation of Cecil Rhodes, and a brief history of the origin and development of the British South Africa Company. It was established in Mashonaland by usurpation of the power of the native king, and in Matabeleland by conquest. In North Rhodesia the authority of the company was based mostly on voluntary treaties with the natives, excepting only the Awemba and Angoni in northeast Rhodesia who had to be subjected by force. What distinguishes the British South Africa Company from similar chartered companies is that it has continued to exist and practically to govern and own the country long after its purpose of winning it for the British Empire had been fulfilled. In spite of the nominal "power and jurisdiction" of Great Britain all the really important affairs of the country are transacted at the office of the company, especially in North Rhodesia with its 2,000 white inhabitants, against 23,000 in South Rhodesia. This has the great advantage of not having colonial questions settled by officials thousands of miles away, but its drawback is the combination of power and commercial interests which this singular government represents. The conflicts arising from this extraordinary situation are worth the study of the jurist as well as the political economist. In this book, the author discusses the political, judicial, and administrative organization of the country, the financial situation, the race question, the problem of the ownership of the soil, the labor problem, the police system, the taxation and education of the natives, the claims of the white settlers, the mining possibilities. In spite of the great material progress which is recorded in these chapters, one cannot help asking whether, in the long run, a policy which tends to transform the mass of the natives from free owners of the soil into an industrial proletariat can have beneficial results for both the country and its inhabitants of either race. M. K. GENTHE.

ECONOMIC AND COMMERCIAL GEOGRAPHY

Industrial and Commercial Geography. By J. Russell Smith. xi and 914 pp. Maps, ills., index. Henry Holt & Co., New York, 1913. $4. 8½ x 6.

With the publication of this volume of 900 pages, containing about 250 illustrations, a new type of geography is made available. The book is almost too large and detailed to be regarded as a "text book" for ordinary class use. It can and will be used as a college text book, and in skillful hands may be made to serve this purpose excellently, but a still more serviceable text book can be made of it by judicious omissions which shall preserve the general plan of the present book while reducing it one third in size. Every American geographer will nevertheless welcome it in its present form, for there is need of a book which presents the principles of industry, commerce and transportation at least as fully as this book does. The author is a Professor of Industry in a School of Finance and Commerce. His training and his interests lead him to lay the emphasis upon the economic factors in commerce and industry more fully than upon the purely geographical factors such as climate, soil, topography, coast line, etc. Indeed, of these four terms only "climate" appears in the index and that with but two references. For example, there is a good chapter on "The Place and Nature of Agriculture," but in that chapter no paragraph deals with the importance of either soil or climate as factors in agriculture. The word "rainfall" occurs once in the chapter and the six rainfall maps printed in the chapter are not referred to in it; but the word "cost" occurs again and again. These instances are cited to illustrate the minor stress which is laid upon the purely geographical topics.

On the other hand, the geographical influences which affect industry and commerce are again and again mentioned and they are fully recognized as great, underlying factors. There unquestionably is a place for an economic geography, written from the point of view of one who is primarily an economist.

Part I, "Industrial Geography" (670 pages) deals with each of the great commodities of commerce, the cereals, starch foods, animal foods, sugar, etc.; also with the great lines of industry, manufacturing, forest industries, metal industries, fisheries, etc. Part II, called "Commercial Geography," deals with trade routes, ocean transportation, trade centers, etc. Chapters III to XI in Part II give accounts of the trade routes of the various lands and seas. They are largely made up of information presented in considerable detail. In contrast to these chapters is XIII, "The Trade Center and Its Development," a chapter filled with ideas and rich in suggestion. These two types of chapters illustrate one of the distinctive qualities of the book and show why it is a blending of the text book and the treatise.

Because of differences in training and consequently in point of view, men will differ in their conception of the right way to treat industrial and commercial geography. Practically all of our secondary school books make a country— *e. g.*, Germany, France, Japan, the United States—the unit of treatment. Some, like Brigham's, make a few important commodities units of treatment, but devote the larger amount of attention to countries. Chisholm's Handbook treats both commodities and countries as units.

Professor Smith does not make countries units of treatment at all, although they are repeatedly referred to. For instance, the silk industry of Japan is discussed in the Chapter on "Fibers, Textiles and Clothing"; and paper making in Japan in the Chapter on "Forest Industries and Paper," and so on. Any one desiring to get a connected idea of the industries of Japan must gather it up from many places in the book. There are some who hold the belief that a book on geography—if it is to be a "geography"—should include regions or countries as units of treatment, though not necessarily to the exclusion of other kinds of units, such for example, as important commodities, trade routes and trade centers. There is a distinction between a text book of commerce and industry and one on commercial and industrial geography. The former may well be an equally valuable contribution to the broader field of industry and commerce of which field the geographic phase is a part.

It is not desired to press this point unduly, for the volume contains a vast amount of material of geographical character, and it places within easy reach of students, teachers and others a wealth of information and ideas that have not heretofore been readily accessible. R. H. WHITBECK.

EDUCATIONAL

Studies in Geology. A Laboratory Manual Based on Topographic Maps and Folios of the United States Geological Survey, for Use with Classes in Physiographic and Structural Geology. By Rollin D. Salisbury and Arthur C. Trowbridge. 68 pp. Henry Holt & Co., New York, 1913. 7½ x 5.

The manual is one of the most helpful aids to students of physiography that has appeared. The directions are clear, the questions are well chosen and call for thought as well as observation, and the subject is well covered in the seventeen chapters. Any one fitting out a laboratory for physiographic study will find in these "studies" a list of tested and valuable maps for class use. The volume is one of the best of the many that have recently appeared in the same field. RICHARD ELWOOD DODGE.

An Elementary Practical Geography for Middle Forms. By Frederick Mort. 91 pp. Maps. Blackie & Son, Ltd., London, 1909. 2s. 8½ x 6½.

A simple and suggestive volume devoted principally to map study, map making and climatic observation. In some cases the subject considered is so simplified as to be indefinite, and the volume as a whole is not adapted to American purposes. The chapters on surveying are the most helpful. RICHARD ELWOOD DODGE.

A Geography of the British Empire. By A. J. Herbertson and R. L. Thompson. In series: The Oxford Geographies. 253 pp. Maps, index. Clarendon Press, Oxford, 1912. 7½ x 5.

The British Isles fill about half of the volume. Diagrams or black-and-white maps are particularly numerous. Questions and exercises conclude the chapters. Emphasis is laid upon physical features and climate, but the human side is not slighted. There is a manifest intent to emphasize those geographical facts which people generally like to know about, yet there are unaccountable omissions. For example, space is found to speak of the many races, and the successive invasions, and occupations of India, yet there is not a word about the most characteristic of all Indian social institutions, the caste system. Cause and consequence are plainly brought out in places. The authors hold that "Three factors—relief, climate and soil, control not only plants, and through them animals, but man himself and even the ideas of man." In the treatment of the British Isles, historical geography receives some attention. The great number of details makes the book interesting to read but difficult to teach. R. H. WHITBECK.

Physical Geography for Schools. By Bernard Smith. viii and 190 pp. Ills., index. Macmillan Co., New York, 1911. $1.10. 8½ x 5½.

This text-book is designed to meet the needs of classes in Great Britain of the American high school grade. The first fourteen chapters give a familiar treatment of the usual forms and processes of the science. The fifteenth considers the geological history of Great Britain, a topic which seems hardly appropriate in a school geography. The last chapter of less than four pages is given over to environmental influences. The "typical American" will be startled to read here that his "cast of countenance" is now strikingly similar to that of a Red Indian Chief. But he will be amused to note in a nearby illustration entitled "British Sailors" a face as closely resembling an Indian's as one would find in a week's travel among Americans. Other brief examples of influences on life are given at the ends of many of the chapters. Other

chapters give no such treatment even though the subjects offer wide and important opportunities, as is the case with glaciers. This meager consideration of the life side of the problem does not follow recent tendencies among American geographers.

The excellencies of the book lie in the full treatment given the British Isles both in text and illustrations, the extended adoption of the proposed technical terms of the science, and the admirable half-tone illustrations.

SUMNER W. CUSHING.

A Practical and Experimental Geography. By Frederick Morrow and Ernest Lambert. xiv and 239 pp. Ills., index. Meiklejohn & Son, London, 1913. 2s. 6d. 7½ x 5.

This closely approaches an elementary field manual for students of surveying and mapping. Beginning with a consideration of measurements and directions, it proceeds step by step through the elements of field surveying, determination of heights and distances, mapping, the use of contours, the making and understanding of the government ordnance maps, the determination of latitude and longitude, weather observations and records, and concludes with a consideration of the shape, size and motions of the earth, the sun and the moon. For students who are looking forward to topographic surveying, mapping, etc., such a course as this book provides would be ideal. For teachers who desire to make geography a somewhat exact science and thereby get from it more mental discipline than is ordinarily sought in geography classes, the book would be useful.

R. H. WHITBECK.

A Scientific Geography. Book 8: South America. By Ellis W. Heaton. 90 pp. Maps, index. Ralph, Holland & Co., London, 1912. 1s. 7½ x 5.

A type of book somewhat common in the British schools but with which we are not familiar in this country. There are seventy-nine pages before the appendix is reached. It is scientific only in a qualified sense, containing more geology and physiography than our elementary books do. The only illustrations are twenty-one sketch maps and diagrams. The causal relations between climate, topography and soil on one hand and products on the other are consistently pointed out. A considerable number of errors have slipped through the proof-reader, *e. g.*, "Colombo" for Colombia, and "west latitude" for west longitude. The book would not be useful in our schools.

R. H. WHITBECK.

The British Isles, with Outlines of Physical Geography. By G. C. Fry. xi and 174 pp. Maps, index. University Tutorial Press, London, 1912. 1s. 6d. 7½ x 5.

One of the numerous small geographies produced in England and designed mainly to supply facts with which to pass examinations. Like all of the books of its type, it compresses many facts and definitions into small space. However, a rational treatment of the leading facts is attempted and underlying causes are frequently well brought out, as, for example, in the section on "Town Sites." The relation of geography to history in the British Isles is often shown rather effectively. Each chapter is followed by a set of questions mostly selected from papers set in the Local Examinations. The book would be useful for supplementary work in any of our schools which desired to lay more stress on the British Isles than American text books ordinarily do.

R. H. WHITBECK.

Atlas Notes. By J. C. Chute. 82 pp. Oxford University Press, London, 1913. 1s. 7½ x 5.

This book, attempting to cover the essentials of the geography of the world in eighty-two small pages, could have no conceivable use in an American school. The author states that "The treatment is on lines of the Army Examinations." Possibly it might, if accurate, serve some use in cramming for an examination. If other parts are as inaccurate as the part dealing with the United States the book will not strengthen the students' knowledge of geography. Many of these inaccuracies are relatively of little moment, but they are not signs of a careful writer.

R. H. WHITBECK.

GENERAL

Letters and Recollections of Alexander Agassiz. With a Sketch of his Life and Work. Edited by G. R. Agassiz. vii and 454 pp. Maps, ills., index. Houghton Mifflin Co., New York, 1913. $3.50. 9 x 6.

This volume is a medley of business and science and personal comment on politics and mining and coral reefs and marine invertebrates, in short a record of a most active career which will be treasured by the intimates of the second Agassiz. Agassiz dismisses Darwin somewhat too curtly in a mere note that he had never spent more than ten days on coral. At somewhat greater length he expresses wonder that Dana could know so little after the many months he had spent on coral reefs. One could wish that Agassiz had been more accurate in his geographical nomenclature while thus disposing of his great predecessors, for some of the island names which he uses are not to be found on any chart. After making due allowance for chirography and the ways of proof-readers we find clear evidence that there was a strain of inaccuracy in himself. In writing of the marine worm palolo, which he misspells, and at the same time misspells the name of the Fijian island at which he observed the annual phenomenon, he observes that only recently had it been called to the attention of naturalists. Yet it had been named fifty years earlier by J. E. Gray, and even then was being monographed by his own assistant, Woodworth. WILLIAM CHURCHILL.

Obed Hussey, Who, of All Inventors, Made Bread Cheap. Edited by Follett L. Greeno. 228 pp. Ills. F. L. Greeno, Rochester, N. Y., 1912. 8 x 5½.

Hussey patented his reaping machine in 1833, demonstrated its practicability and it was successful from the first. The fundamental principles of all harvesting machinery to-day were supplied by Hussey's machine. He was not, however, a man of busines acumen, his interests were not well looked after and rivals secured most of the honor and the profit that should have been his portion. This book records his struggles, his reaper and its success and the methods by which his ideas built up the prosperity of others than himself. The narrative is based upon the citation of evidence as to the priority of Hussey's claims and the great merits of his invention as demonstrated and recorded both in the United States and England.

A Journey to the Earth's Interior, or, Have the Poles Really Been Discovered? By Marshall B. Gardner. 69 pp. Ills. The author, Aurora, Ill., 1913. 8½ x 5½.

More pathetic than amusing. The author has theoretically discovered a hole embracing most of the interior of the earth and passing from Pole to Pole through the earth's center. He has provided it with a central sun whose beams, escaping from the northern and southern orifices, account for the phenomena of the aurora borealis and the aurora australis; and he bolsters his theory farther with red snow, driftwood in high latitudes, the dip of the needle, the migrations of Polar animals, etc., some of which phenomena have been fully explained and others are not exactly what he describes them to be. All this is set forth very seriously and the work is "dedicated to the continued progress of science and the service that it can render to humanity."

Papers on Inter-Racial Problems. Communicated to the First Universal Races Congress held at the University of London, July 26-29, 1911. Edited by G. Spiller. xvi and 485 pp. Index. World Peace Foundation, Boston, 1911. 10 x 6½.

In this volume are some sixty essays which were proposed for consideration at the first Universal Races Congress in London in 1911. They represent the attitude with which distinguished authorities approached that informing meeting. Of any single paper in the collection we may say that it offers the fullest possible statement of principles short of the point where controversy must arise and where further development becomes matter of argument against fixed convictions. WILLIAM CHURCHILL.

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These notes do not preclude more extended reference later

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THE LOWERY COLLECTION: A descriptive list of maps of the Spanish possessions within the present limits of the United States, 1502-1820. By W. Lowery. Edited with notes by P. L. Phillips. x and 567 pp. Index. Library of Congress, Washington, 1912. $1. 10 x 7½.

THE HISTORY OF GEORGIA. Containing brief sketches of the most remarkable events up to the present day (1784). By Capt. Hugh M'Call. x and 565 pp. Index, ill., 1811. Reprinted by A. B. Caldwell, Atlanta, Ga., 1909. $4.25. 9½ x 6½.

THE HOLLANDERS OF IOWA. By Jacob Van der Zee. 453 pp. Index. Historical Soc. of Iowa, Iowa City, 1912. $3. 9 x 6.

ILLUSTRATED HISTORY OF NEW MEXICO. By B. M. Read. Translated into English, under the direction of the author, by E. Baca. 804 pp. Ills., index. B. M. Read, Santa Fé, N. M., 1912. $10. 10 x 7.

THE IMMIGRANT INVASION. By Frank J. Warne. 336 pp. Ills., index. Dodd, Mead & Co., New York, 1913. $2.50. 8½ x 5½.

THE INDIAN TRIBES OF THE UPPER MISSISSIPPI VALLEY and Region of the Great Lakes as described by Nicholas Perrot, French commandant in the Northwest; Bacqueville de la Potherie, French royal commissioner to Canada; Morrell Marston, American army officer; and Thomas Forsyth, U. S. agent at Fort Armstrong. Translated, edited, annotated, and with bibliography by E. H. Blair. Vol. 1: 372 pp. Vol. 2: 412 pp. Map, ills., index. A. H. Clark Co., Cleveland, O., 1912. 9½ x 6½.

HISTORICAL NARRATIVES OF PUGET SOUND, HOOD'S CANAL, 1865-1885. The experience of an only free man in a penal colony. By E. Clayson, Sr. 106 pp. The author, Seattle, Wash. 50 cts. 7½ x 5½.

LAKE GEORGE AND LAKE CHAMPLAIN. The war trail of the Mohawk and the battleground of France and England in their contest for the control of North America. By W. M. Reid. xviii and 381 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1910. $3.50. 9½ x 7.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. GEOLOGICAL SURVEY

Topographic Sheets

(Including Combined and Special Topographic Maps)

Alabama-Georgia. Seale Quadrangle.* Surveyed in 1910-1911. 1:62,500. 32°30′ - 32°15′ N.; 85°15′ - 85°0′ W. Contour interval 20 ft. Edition of Mar. 1914.

California. (a) Brentwood Quad. Surveyed in 1911. 1:31,680. 38°0′0″ - 37°52′30″ N.; 121°45′0″ - 121°37′30″ W. Interval 5 ft. Edit. of Feb. 1914.

(b) Caliente Quad.* Surveyed in 1910-1912. 1:125,000. 35°30′ - 35°0′ N.; 119°0′ - 118°30′ W. Interval 100 ft. Edit. of May 1914.

(c) Capitola Quad.* Surveyed in 1911-1912. 1:62,500. 37°0′ - 36°45′ N.; 122°0′ - 121°45′ W. Interval 25 ft. Edit. of April 1914.

(d) Cholame Quad. Surveyed in 1907-1908. 1:125,000. 36°0′ - 35°30′ N.; 120°30′ - 120°0′ W. Interval 100 ft. Preliminary edition, Mar. 1914.

(e) Folsom Quad. Surveyed in 1908. 1:31,680. 38°45′0 - 38°37′30″ N.; 121°15′0″ - 121°7′30″ W. Interval 5 ft. Preliminary edition, Feb. 1914.

(f) Hamilton Quad. Surveyed in 1904. 1:31,680. 39°45′0″ - 39°37′30″ N.; 122°7′30″ - 122°0′0″ W. Interval 5 ft. Edit. of Feb. 1914.

(g) Kirkwood Quad. Surveyed in 1904. 1:31,680. 39°52′30″ - 39°45′0″ N.; 122°15′0″ - 123°7′30″ W. Interval 5 ft. Edit. of Mar. 1914.

(h) Lost Hills Quad. Surveyed in 1907-1908. 1:125,000. 36°0′ - 35°30′ N.; 120°0′ - 119°30′ W. Interval 100 ft. Preliminary edition, Feb. 1914.

(i) McIntosh Landing Quad. Surveyed in 1904. 1:31,680. 39°52′30″ - 39°45′0″ N.; 122°7′30″ - 122°0′0″ W. Interval 5 feet. Edit. of Mar. 1914.

(j) Orland Quad. Surveyed in 1904. 1:31,680. 39°45′0″ - 39°37′30″ N.; 122°15′0″ - 122°7′30″ W. Interval 5 ft. Edit. of Mar. 1914.

[Maps (a), (e), (f), (g), (i) and (j) belong to the two-inches-to-the-mile map of the San Joaquin-Sacramento Valley; the northeastern half of map (e) is blank. The western two-thirds of map (d) and the eastern three-fifths of map (h) are likewise blank. On map (c) the green tint differentiates between (1) timber, (2) timber and brush and (3) brush.]

Colorado. Meeker Quad. Surveyed in 1911-1912. 1:62,500. 40°15′ - 40°0′ N.; 108°0′ - 107°45′ W. Interval 50 ft. Edit. of Feb. 1914.

[Coextensive with the southwestern corner of the Danforth Hills special sheet, 1:125,000, published in 1910, which is a reprint of the topographic base of a geologic map in *U. S. G. S. Bull. 415*.]

Illinois. Centralia Quad.* Surveyed in 1908 and 1912. 1:62,500. 38°45′ - 38°30′ N.; 89°15′ - 89°0′ W. Interval 10 ft. Edit. of April 1914.

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* On these sheets woods are shown in green.

Iowa. Madrid Quad.* Surveyed in 1911. 1:62,500. 42°0′ - 41°45′ N.; 94°0′ - 93°45′ W. Interval 20 ft. Edit. of April 1914.

Kentucky. Dunmor Quad.* Surveyed in 1911. 1:62,500. 37°15′ - 37°0′ N.; 87°0′ - 86°45′ W. Interval 20 ft. Edit. of Feb. 1914.

Louisiana. Baxter Bayou Quad.* Surveyed in 1909 and 1911. 1:31,680. 32°52′30″ - 32°45′0″ N.; 91°22′30″ - 91°15′0″ E. Interval 5 ft. Preliminary edition, Mar. 1914.

[Belongs to the series of two-inches-to-the-mile maps of the alluvial valley of the Mississippi of which the others were listed in the *Bull.:* under "Louisiana," Vol. 43, 1911, p. 75, Vol. 44, 1912, p. 398, Vol. 45, 1913, pp. 476 and 555-556; and under "Mississippi," Vol. 43, 1911, p. 75 and Vol. 45, 1913, pp. 476. The western quarter of the present map is blank.]

Maine. (a) Bethel Quad.* Surveyed in 1911-1912. 1:62,500. 44°30′ - 44°15′ N.; 71°0′ - 70°45′ W. Interval 20 ft. Edit. of April 1914.

(b) Bryant Pond Quad.* Surveyed in 1911. 1:62,500. 44°30′ - 44°15′ N.; 70°45′ - 70°30′ W. Interval 20 ft. Edit. of Feb. 1914.

Mississippi-Alabama-Tennessee. Iuka Quad.* Surveyed in 1909 and 1911. 1:62,500. 35°0′ - 34°45′ N.; 88°15′ - 88°0′ W. Interval 20 ft. Edit. of Feb. 1914.

Missouri. (a) Green City Quad.* Surveyed in 1911-1912. 1:62,500. 40°30′ - 40°15′ N.; 93°0′ - 92°45′ W. Interval 20 ft. Edit. of April 1914.

(b) Smithville Quad.* Surveyed in 1912. 1:62,500. 39°30′ - 39°15′ N.; 94°45′ - 94°30′ W. Interval 20 ft. Edit. of April 1914.

[Map (b) coextensive with the northeast quarter, of the old Kansas City, Kan.-Mo., sheet, 1:125,000, originally surveyed in 1885 and 1887.]

Montana. Brockton Quad.* Surveyed in 1910-1911. 1:62,500. 48°15′ - 48°0′ N.; 105°0′ - 104°45′ W. Interval 20 ft. Edit. of Mar. 1914.

New Mexico. Alamo National Forest.* Surveyed in 1909-1911. 1:250,000. 33°30′ - 32°30′ N.; 106°0′ - 105°0′ W. Interval 200 ft. Edit. of Feb. 1914.

[Outside of the Alamo National Forest and the Mescalero Apache Indian Reservation the sheet is blank.]

New Mexico-Colorado. Raton Quad.* Surveyed in 1911-1912. 1:62,500. 37°0′ - 36°45′ N.; 104°30′ - 104°15′ W. Interval 50 ft. Edit. of May 1914.

Ohio. (a) Bryan Quad.* Surveyed in 1911. 1:62,500. 41°30′ - 41°15′ N.; 84°48′ - 84°30′ W. Interval 10 ft. Edit. of Feb. 1914.

(b) Celina Quad.* Surveyed in 1911. 1:62,500. 40°45′ - 40°30′ N.; 84°48′ - 84°30′ W. Interval 10 ft. Edit. of Mar. 1914.

(c) Navarre Quad.* Surveyed in 1911. 1:62,500. 40°45′ - 40°30′ N.; 81°45′ - 81°30′ W. Interval 20 ft. Edit. of Mar. 1914.

(d) Paulding Quad.* Surveyed in 1911. 1:62,500. 41°15′ - 41°0′ N.; 84°48′ - 84°30′ W. Interval 10 ft. Edit. of Feb. 1914.

[Maps (a), (b) and (d) are extended beyond the limits of a sheet of regular size so as to include all the area to the Indiana-Ohio boundary on the west.]

Ohio-Michigan. (a) Pioneer Quad.* Surveyed in 1911. 1:62,500. 41°45′ - 41°30′ N.; 84°48′ - 84°30′ W. Interval 10 ft. Edit. of Mar. 1914.

(b) Swanton Quad.* Surveyed in 1911. 1:62,500. 41°45′ - 41°30′ N.; 84°0′ - 83°45′ W. Interval 10 ft. Edit. of Mar. 1914.

[Map (a) is extended beyond the regular limits similar to maps (a), (b) and (d) of the previous entry.]

Texas. Gay Hill Quad. Surveyed in 1911. 1:62,500. 30°30′ - 30°15′ N.; 96°30′ - 96°15′ W. Interval 25 ft. Edit. of Mar. 1914.

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* On these sheets woods are shown in green.

West Virginia. (a) Big Bend Quad.* Surveyed in 1912. 1:62,500. 37°45′-37°30′ N.; 81°0′-80°45′ W. Interval 50 ft. Edit. of April 1914.

(b) Eccles Quad.* Surveyed in 1911. 1:62,500. 38°0′-37°45′ N.; 81°30′-81°15′ W. Interval 50 ft. Edit. of Feb. 1914.

(c) Flattop Quad.* Surveyed in 1911. 1:62,500. 37°45′-37°30′ N.; 81°15′-81°0′ W. Interval 50 ft. Edit. of Mar. 1914.

[Coextensive respectively with the southeastern quarter of the old Hinton sheet, 1:125,000, surveyed in 1886-8, and the northwestern and the southeastern quarters of the old Raleigh sheet, 1:125,000, originally surveyed in 1883-85 and resurveyed in 1894-95.]

Wyoming. (a) Cheyenne Quad. Surveyed in 1911. 1:125,000. 41°30′-41°0′ N.; 105°0′-104°30′ W. Interval 50 ft. Edit. of Feb. 1914.

(b) Hanna Quad. Surveyed in 1911-1912. 1:62,500. 42°0′-41°45′ N.; 106°45′-106°30′ W. Interval 25 ft. Edit. of Mar. 1914.

(c) Walcott Quad. Surveyed in 1912. 1:62,500. 42°0′-41°45′ N.; 107°0′-106°45′ W. Interval 25 ft. Edit. of April 1914.

[Maps (b) and (c) coextensive respectively with the northeastern and northwestern quarters of the Fort Steele sheet, 1:125,000, surveyed in 1891.]

U. S. Coast and Geodetic Survey†

North Carolina. (a) Pamlico Sound: Western Part. 1:80,000. 35°41′-34°56′ N.; 76°42′-75°58′ W. 1 color. With inset: Continuation of Bay River. 1:80,000. 35°11′-35°5′ N.; 76°47′-76°41′ W. 1 color. Chart No. 1231. Feb. 1914. Price 50 cts.

(b) Cape Hatteras: Wimble Shoals to Ocracoke Inlet. 1:80,000. 35°34′-35°0′ N.; 76°5′-75°10′ W. 1 color. Chart No. 1232. April 1914. 50 cts.

[These two charts together cover approximately the area shown on previous Charts Nos. 142, 143, 144^1 and 144^2.]

Oregon-Washington. (a) Columbia River: Entrance to Harrington Point. 1:40,000. 46°20′-46°7′ N.; 124°14′-123°40′ W. 1 color. Chart No. 6151. May 1914. 50 cts.

(b) Columbia River: Harrington Point to Grims Island. 1:40,000. 46°20′-46°6′ N.; 123°40.7′-123°7.8′ W. Chart No. 6152. April 1914. 50 cts.

(c) Columbia River: Grims Island to St. Helens. 1:40,000. 46°12.1′-45°51.2′ N.; 123°8.2′-122°43.0′ W. Chart No. 6153. 50 cts.

[These three charts together cover approximately the section of the Columbia shown on previous Charts Nos. 6140-6144.]

Pennsylvania-New Jersey. Delaware River: Philadelphia to Trenton. 1:40,000. 40°13.6′-39°58.8′ N.; 75°4.6′-74°41.9′ W. 1 color. With inset: Trenton. 1:20,000. 40°13.7′-40°11.0′ N.; 74°47′-74°44′ W. 1 color. Chart No. 296. April 1914. 50 cts.

[Replaces, on twice the scale, the inset on Chart No. 126 (see *Bull.*, Vol. 43, 1911, p. 545.]

Philippine Islands. (a) Harbors of Samar and Leyte. [Five maps, all one color:] (1) Port Palompon, West Coast of Leyte. Surveyed 1906. 1:10,000. 11°4′-11°2′ N.; 124°21.4′-124°23.7′ E. (2) Biliran Strait, North Coast of Leyte. Surveyed 1908. 1:20,000. 11°29′-11°26′ N.; 124°26.6′-124°31.2 E. (3) Parasan Harbor, West of Samar. Surveyed 1910. 1:10,-000. 11°42′ N. and 124°45′ E. (4) Santo Niño Harbor, North Coast of Santo Niño I., West of Samar. Surveyed in 1912. 1:5,000. 11°55′45″ N. and 124°27′ E. (5) Jibatan River, West Coast of Samar. Surveyed in 1912. 1:50,000. 12°6′ N. and 124°32′ E. Chart No. 4456. April 1914. 30 cts.

(b) Visayan Sea. [1:200,000]. 11°55′-10°40′ N.; 122°34′-124°25′ E. 1 color. Chart No. 4405. Mar. 1914. 50 cts.

* On these sheets woods are shown in green.

† Only new charts are listed, not new editions of old charts.

South Carolina-Georgia-Florida. Charleston Light to Cape Canaveral. [Mean meridional scale 1:450,000]. 32°43′ - 28°27′ N.; 81°40′ - 78°7′ W. Chart No. 1111. April 1914. 50 cts.

[Comprises about the same area as Charts Nos. 12 and 13.]

Porto Rico. (a) Culebra Island and Approaches, West Indies. 1:20,000. 18°22.8′ - 18°14.4′ N.; 65°23.8′ - 65°11.7′ W. 2 colors. Chart No. 914. Feb. 1914. 50 cts.

(b) Target Bay and Vicinity, Culebra Island. 1:10,000. 18°19.7′ - 18°16.4′ N.; 65°21.0′ - 65°15.8′ W. 1 color. Chart No. 915. Mar. 1914. 25 cts.

(c) Great Harbor, Culebra Island. 1:6,500. 18°19′9″ - 18°16′23″ N.; 65°18′34″ - 65°15′4″ W. Chart No. 913. Mar. 1914. 50 cts.

ASIA

Japan. [Two maps:] (1) Vulkanische Zonen des Aso und Kirischima auf Kiuschiu. [1:2,000,000]. 34° - 31° N.; 129⅓° - 132° E. 2 colors. (2) Geologische Übersicht der Umgebung des Vulkans Sakurajima. 2 colors. Nach K. Nakajima. 1:200,000. [31⅗° N. and 130⅗° E.] Accompany, on Taf. 24, "Der verheerende Ausbruch des Vulkans Sakurajima im Süden der japanischen Insel Kiuschiu" by K. Nishio and I. Friedlaender, *Petermanns Mitt.*, Vol. 60, I, 1914, March, pp. 132-133.

AUSTRALASIA AND OCEANIA

Australia. (a) Sketch Map of South East Australia Showing the Position of the Federal Territory among the Three Massifs. 1:10,000,000. 30½° - 40° S.; 143° - 154° E.

(b) Sketch Map of Australia Showing the Relation of the Population to the Rainfall & Tropics, Based on Government Data. 1:30,000,000. 10° - 43° S.; 110° - 160° E.

(c) Diagrams [of Australia] Showing the Relation of "Canberra" to the Summer and Winter Rain "Crescents." [1:40,000,000]. [10° - 43° S.; 110° - 155° E.] (1) January Isohyets. (2) July Isohyets.

(d) Sketch Map of South East Australia Showing the Position of the Rival Sites. 1:10,000,000. 30½° - 40° S.; 143° - 154° E.

(e) The Salient Geological Features of the Federal Territory, by Taylor & Mahony. 1:750,000. 34°58′ - 35°57′ S.; 148°46′ - 149°40′ E.

(f) Approximate Contours in the Northern Part of the Federal Territory. 1:750,000. 34°58′ - 35°42′ S.; 148°45′ - 149°42′ E.

(g) The Physiographic Divisions of the Federal Territory. 1:750,000. 34°58′ - 35°42′ S.; 148°45′ - 149°42′ E.

(h) Sketch Map of the Federal Territory to illustrate the paper by Griffith Taylor, B.Sc., B.E., B.A., F.G.S. 1:400,000. 35°8′ - 35°57′ S.; 148°46′ - 149°24′ E. 2 colors.

Accompany respectively as Figs. 1, 2, 3, 4, 5, 6, 8A, on pp. 379, 381, 383, 386, 388, 390 and 394, and as separate plate, "The Evolution of a Capital: A Physiographic Study of the Foundation of Canberra, Australia" by G. Taylor, *Geogr. Journ.*, Vol. 43, 1914, No. 4, pp. 378-395.

[Map (a) shows relief by 1,000 and 3,000 ft. contours. Three population density grades distinguished on map (b): (1) less than, (2) more than 1 person in 4 sq. miles and (3) over 4 persons per sq. mile, and 5 sizes of towns shown. On map (f) the following elevations are indicated: under 1,900 ft., 1,900-2,400 ft., more than 2,400 ft. On the general topographic map (h) relief is in brown shading and drainage in blue.]

Dutch New Guinea. Sketch Map to illustrate Explorations in Dutch New Guinea by A. F. R. Wollaston, M.A., M.B., 1912-13. 1:800,000. 4° - 5° S.; 137°0′ - 137°31′ E. 2 colors. With inset showing location of main map.

Accompanies "An Expedition to Dutch New Guinea" by A. F. R. Wollaston, *Geogr. Journ.*, Vol. 43, 1914, No. 3, pp. 248-273.

[Route led up the Setakwa and the headwaters of the Utakwa River nearly to the top of Mt. Carstensz in the Nassau Range. Relief shows in brown shading.]

Papua (British New Guinea). Sketch Map showing the routes followed by W. M. Beaver in the Girara District, Western Papua, 1910-13. 1:400,000. 7°47′ - 8°33′ S.; 142°51′ - 143°47′ E. 1 color. With inset, 1:30,000,000, showing location of main map. Accompanies "A Description of the Girara District, Western Papua," by W. M. Beaver, *Geogr. Journ.*, Vol. 43, 1914, No. 4, pp. 407-413.

[District lies in the coastal lowland on the northern side of the estuary of the Fly River.]

WORLD AND LARGER PARTS

World. [Two hemispheres:] (1) Erdkarte in mittabstandstreuer Azimutalprojektion mit dem Mittelpunkt Strassburg. Berechnet und entworfen von Prof. Dr. Emil Rudolph und Dr. Siegmund Szirtes. 1:38,000,000. 3 colors. (2) Erdkarte in mittabstandstreuer Azimutalprojektion mit dem Antipodenpunkt von Strassburg als Mittelpunkt. Berechnet und entworfen von Prof. Dr. Emil Rudolph und Dr. Siegmund Szirtes. 1:38,000,000. 3 colors. Accompany, as Taf. 27 and 28, "Zur Erklärung der geographischen Verteilung von Grossbeben" by E. Rudolph and S. Szirtes, *Petermanns Mitt.*, Vol. 60, I, 1914, March, pp. 124-130, and April, pp. 184-189.

[Two hemispheres on the equidistant azimuthal (Postel's) projection to facilitate the location of earthquakes registered at the seismological station in Strassburg. Circles of distance are drawn for every 1,000 kilometers, and azimuth lines for every 10°. As the reviewer has pointed out (*Ann. Assoc. Amer. Geogrs.*, Vol. II, 1912, pp. 49-54), the use of Postel's projection for this purpose is entirely correct in principle and has the advantage over the stereographic, whose use was there suggested because it can be more easily drawn, in that the interval between the circles of distance remain the same, while on the stereographic projection it becomes twice as much on the margin as at the center. At all events, it is very gratifying to see that the inappropriate use of Mercator's projection for such maps—which was commented on in "New Maps" under "World" in the *Bull.*, Vol. 43, 1911, p. 879—is gradually being discarded. On the present map, in addition, are shown: volcanoes, active and inactive, tectonic lines, and the epicenters and areas of influence of major earthquakes. Proper editing would have eliminated the obsolete representation of northeast Greenland and the coast of Victoria Island as well as the ultra-conservative treatment of the Antarctic Continent.]

Other Maps Received

NORTH AMERICA

United States

Connecticut. Map of Connecticut, prepared by U. S. Geological Survey in cooperation with the State of Connecticut. 1:125,000. U. S. Geological Survey, Washington, D. C., 1893, reprinted 1912.

Kentucky. (a) [Twelve county maps on the scale of 2 miles to the inch, all, except (1), by J. B. Hoeing, viz.:] (1) Warren County, 1891, by J. E. McAdoo; (2) Meade and Breckenridge Counties, 1891; (3). Henry, Shelby and Oldham Counties; (4) Washington and Marion Counties; (5) Clinton County; (6) Boyle and Mercer Counties; (7) Bath and Fleming Counties; (8) Madison County; (9) Montgomery and Clark Counties; (10) Lincoln County; (11) Spencer and Nelson Counties; (12) Mason County. The Kentucky Geological Survey, Frankfort, Ky.

(b) Map of the Jackson Purchase, comprising Ballard, McCracken, Marshall, Graves, Calloway, Hickman and Fulton Counties, by J. B. Hoeing. 2 miles to the inch. The Kentucky Geological Survey, Frankfort, Ky., 1885.

(c) Jackson Purchase. 1:300,000. The Kentucky Geological Survey, Frankfort, Ky., 1886.

(d) Map of the Big Sandy Valley, by J. B. Hoeing. 4 miles to the inch. The Kentucky Geological Survey, Frankfort, Ky., 1905.

(e) Map of Cumberland Mountain System, by J. B. Hoeing. 4 miles to the inch. The Kentucky Geological Survey, Frankfort, Ky., 1891.

(f) Preliminary Geological Map of Kentucky, by J. B. Hoeing. 10 miles to the inch. The Kentucky Geological Survey, Frankfort, Ky., 1907.

Oklahoma. Indian Territory, surveyed under the direction of Charles H. Fitch, topographer, 1895-1899. 1:500,000. U. S. Geological Survey, Washington, D. C., 1902.

Western States. [Maps showing] Lands Designated by the Secretary of the Interior as Subject to Entry Under the Provisions of the Enlarged Homestead Act of Feb. 19, 1909, on the scale of 1 inch to 24 miles: States of Montana, Wyoming, Nevada, Oregon, Utah, Colorado, and North Dakota, and Territories of Arizona and New Mexico. Department of the Interior, Washington, D. C., 1912.

Canada

Alberta. Southern Alberta. Map showing disposition of lands. 1:792,000. Railway Lands Branch, Department of the Interior, Ottawa, 1914.

British Columbia. Map 43A: Sooke sheet, Vancouver Island, 1:125,000; 92A: Coast and Islands between Queen Charlotte Sound and Burke Channel, 1:253,440. Geological Survey of Canada. Department of Mines, Ottawa, 1914.

New Commercial Map of British Columbia. 1:1,520,640. Insets: Vancouver District; Geological map of British Columbia; Southeast Vancouver Island. Carl Pitner & Co., Ltd., Vancouver, B. C.

Manitoba. Cereal map of Manitoba, showing acreage under crop in each township in wheat, oats, barley and flax. 1:792,000. Department of the Interior, Ottawa, 1914.

Ontario. Stovel's Railway, Commercial Routing and Shippers' Map of Ontario. Inset: Section showing railways between Fort William and North Bay. The Stovel Co., Winnipeg, 1910.

Saskatchewan. Saskatchewan: Map Showing Disposition of Lands. Corrected to Jan. 1st, 1914. 1:792,000. Railway Lands Branch, Department of the Interior, Ottawa.

AFRICA

British East Africa. East Africa Protectorate: General Plan. 1:1,500,000. Survey Department, Cadastral Branch, Nairobi, B. E. A.

Mombasa-Victoria (Uganda) Railway and Busoga Railway. 1:15,000,000. The Director of Surveys, Nairobi, B. E. A., 1913.

Rhodesia. British Central Africa: 1:250,000. Sheet 105-G, Songwe River; 105-K, Nyika Plateau; 111-F, Fort Manning; 111-G, Dowa; 111-H, Fort Maguire; 111-K, Dedza Boma; 111-L, Mlangeni; 111-O, Kirk Mountains; 111-P. Blantyre; 117-D, Chiromo; 117-H, Sena. Corrected to 1902. Surveyor-General's Office, Salisbury, Rhodesia.

Map of Southern Rhodesia in 11 sheets. 5 miles to the inch. The Surveyor-General's Office, Salisbury, Rhodesia, 1914. Price £3.

French Equatorial Africa. Côte ouest d'Afrique. (1) De l'Estuaire du Gabon à la Baie de Pointe Noire; (2) Bas-Ogooué [showing 22 lakes], 1:50,000; (3) Baie de Pointe Noire, 1:10,000, 1910; (4) Baie du Cap Lopez, Mouillage de Mandji, 1:10,000, 1911. Mission Hydrographique du Gabon, Ministère des Colonies, Paris.

ASIA

India. Military traffic map of India. 1 in.=64 mi. Survey of India Office, Calcutta [1914]. Price 1 rupee 8 annas.

[Survey of India]. Sheet 2 M/15, Parts of Dindings Territory and Lower Perak District; 2 M/11, Parts of Dindings Territory, K. Kangsar & L. Perak Districts; 2 M/7, Parts of Matang, Kuala Kangsar, Larut Districts & Dindings Territory. 1:63,360. Survey of India Office, Calcutta, 1912. Price $2.50 each.

AUSTRALASIA AND OCEANIA

Tasmania. Sketch map, General geological features of Tasmania. 15 miles to the inch. Surveyor-General's Office, Hobart.

Victoria. Murmungee. 40 chains to the inch. Geological Survey of Victoria. [Melbourne], 1914.

Wagra. 40 chains to the inch. Geological Survey of Victoria. [Melbourne], 1914.

EUROPE

Germany. Rhein-Maas-Schelde-Kanal. (a) Entwurf Hentrich 1899, Uebersichtskarte, 1:1,000,000. (b) Lageplan, 1:200,000. Worms & Lüthgen, Crefeld, 1913.

Geologische Karte von Preussen und benachbarten Bundesstaaten. 1:25,000. Lieferung 184: Blatt Hünfeld, Grad-Abteilung 69 no. 21; Blatt Tann, Grad-Abteilung 69 no. 23; Blatt Fulda, Grad-Abteilung 69 no. 27; Blatt Weyhers, Grad-Abteilung 69 no. 33. Königlich Preussische Geologische Landesanstalt, Berlin, 1912.

Greece. Map of Greek Kingdom [in Greek], 1:75,000. Sheets: Neochorion, Tsagesi, Aguia, Aidepsos, Koniskos-Helasson, Rapsane-Tempe, Trikkala, Larissa. Greek General Staff, Athens.

Iceland. Generalstabens Topografiske Kort [of Iceland]. 1:50,000. Sheet 3 N.V. Látrabjard; 13 S.V. Siglunes; 13 N.A. Brjánslaekur; 23 N.V. Vattarnes; 23 N.A. Porskafjördur; 33 S.A. Hrútafjördur; 33 N.V. Tröllatunga; 33 N.A. Broddanes; 34 S.A. Hrútafjardará; 34 N.A. Bordeyri; 34 N.V. Asgardur; 34 S.V. Kvennabrekka; 35 N.A. Fornihvammur. Generalstabens topografiske Afdeling, Kjöbenhavn. 1914.

EDUCATIONAL

Gold Coast. Wall map of the Gold Coast Colony, Ashanti and the Northern Territories. Prepared for the use of the Gold Coast Government schools by Major F. G. Guggisberg, C.M.G. 1:400,000. Surveyor-General's Office, Accra, Gold Coast Colony, 1908.

Erratum

Colorado. Mr. R. D. George, State Geologist of Colorado, kindly calls attention to the following corrections of statements made in the review of the topographic and the geologic map of Colorado, 1:500,000, in the *Bulletin* for April (Vol. 46, 1914), p. 315: (1) The base used for these maps was prepared by the Colorado Geological Survey; (2) the physical features of the Denver area are shown on the topographic map within the range of expression (5,500 ft. contour and drainage) and the most important cultural features are shown in an insert on the margin of the map; (3) including all differentiation, by color, pattern and symbol, 145 sedimentary formations, 55 types of igneous and 11 types of metamorphic rocks are distinguished on the geologic map; (4) the areas shown in detail on this map include the results of all recent detailed geological work of the United States Geological Survey and the Colorado Geological Survey to January, 1912.

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VOL. XLVI 1914 No. 8

THE HOME STUDY OF CORAL REEFS

By W. M. DAVIS
Harvard University

Introduction. If a geographer or a geologist, who has never seen any coral reefs, nevertheless has occasion to give some account of their origin, two courses are open to him. He may simply quote, without expressing his own opinion, the observations and opinions of those who have seen coral reefs; or he may attempt, after a more or less critical study of the reports of original observers, to form an opinion of his own. The first course is apparently easy to follow, but in this problem it would give little satisfaction because the opinions of the original observers are diverse and contradictory. The second course is not easy to follow but it is well worth attempting. The chief difficulty about it is that there is no generally adopted, standardized method of scientific investigation, in accord with which various original observers of coral reefs have conducted their studies, and by comparison with which the sufficiency of their studies and the trustworthiness of their results can be measured. Each stay-at-home inquirer must therefore, before he can independently form an opinion regarding the more important current views on coral reefs, more or less consciously establish for himself a generalized method of investigation, with which the investigations published by others may be compared. In establishing such a method he must select its essential steps from various examples of approved studies previously accomplished; he must test its efficiency by applying it in problems of his own, and with increasing experience he must revise and extend it; he should eventually

arrange the successive steps of the generalized and well-reasoned method in such order that it shall be of general application in problems of physical geology and physical geography.

The generalized method of investigation outlined below has come to my own knowledge not as a method already formulated in the study of logic, although it has long been familiar to logicians; but in the gradual way just indicated, and largely from the writings of Gilbert and of Chamberlin. It seems to be used by some students of earth science, but not by all; yet it would appear to be essential in the solution of problems that involve the discovery of the past origin of the earth's present features. The method has repeatedly been helpful in guiding various studies of my own, and I have come to feel much confidence in its value. Hence it is with this generalized method that it is now proposed, for my own satisfaction and for the information of those who are interested in the problem here considered, to compare several investigations of coral reefs, in order to see how far they meet the requirements of systematized procedure, and how far they may therefore be accepted as convincing to a stay-at-home inquirer, as well as to those who conducted them.

This plan of discussion is more novel in appearance than in reality; for any home student, who does not merely accept theoretical conclusions on the authority of traveled observers, must more or less consciously examine the methods by which the conclusions have been reached, and in so doing he must reject conclusions that are not reached by methods satisfactory to himself; but while he commonly announces, in his teaching or his writing, the acceptance or the rejection of the conclusions reached by others, his ideas as to the fundamental requirements of a thoroughly satisfactory method of investigation and of the degree of approach to such requirements made by the investigations that he has been studying are often passed over in silence. It is here proposed to state them explicitly.

It is assumed that the home student, who has never seen any coral reefs, wishes not merely to know the present forms, dimensions and appearance of these extraordinary structures, but also to understand their origin. It must therefore be recognized that observation alone will not suffice to lead to the desired end, for the origin of coral reefs involves the action of unobservable processes during irrecoverable past time. However fully one may believe that certain processes were in their time and place quite as truly facts as are any observable processes of to-day, it is evident that observation

alone will not discover them: they can be discovered only by seeing and thinking—by observing and theorizing. Hence the old adage: "Go and see," should in studying problematic phenomena like coral reefs, be replaced with the newer adage: "See and think."

Chief Steps of an Investigation. The chief steps to be taken in the attempt to decipher the past origin of an existing earth-feature may be outlined in the following order: observation, comparison, generalization, inquiry, invention, deduction, confrontation, revision, judgment; or, to state them somewhat more fully: the determination of visible, accessible, existing facts by direct observation; the establishment of generalizations by the inductive comparison of similar facts; then, prompted by a spirit of wonder and inquiry regarding the seen facts and guided by previously acquired pertinent knowledge, the invention of as many provisional schemes, or "working hypotheses," as possible, each embodying an imaginary outline process, which, if mentally extended and traced through its imagined sequence of changes in past time, may lead to concepts that are the counterparts of the present facts, and thus constitute what is called their "explanation"; next, the deduction, consistently with established principles, of all the possible consequences from each outline scheme or working hypothesis, in the expectation that, while some of the consequences will be the counterparts of the facts already observed, others may be the counterparts of facts still to be observed, the discovery of which may thus be intelligently directed; further, the confrontation of the various sets of consequences deduced from each hypothesis with the appropriate facts, in order to measure the closeness of their agreement; then the revision of the whole process, including the observational search for previously unseen facts, of which the possible existence is now suggested by the consequences deduced from the several working hypotheses, the strengthening of weak generalizations by larger induction, the invention if necessary of new hypotheses or the modification of the previously invented hypotheses in any way that will enable any one of them better to account for the growing store of facts and generalizations, the pursuit of new deductions previously overlooked but now demanded by new facts, and the renewed confrontation of deduced consequences and observed facts; finally the impartial judgment of the sufficiency with which the consequences of the most successful hypothesis can account for the total collection of facts, and of the failure of the other hypotheses.

Let it be recognized, however, that the order of making all these

steps during an actual investigation is usually very irregular, with many advances and returns and with many running leaps as well as slow paces. The order here given is simply a logical arrangement, adopted as an aid in systematic presentation after the investigation is well advanced or completed. Be it further recognized that experimentation, which is so important an aid and supplement to seeing and thinking in many problems of physical science, is here intentionally omitted, because, in most problems of geology and geography, experiments have rather an illustrative than a demonstrative value. Finally, let no one expect that young students can, before their minds are disciplined, make the succession of steps here outlined: that would be like expecting a baby to walk alone, before its bones are strengthened. A bright young student of eighteen or twenty may, to be sure, understand each step, as it is explained to him; but he will do well if, at twenty-three or twenty-five, he can make all the steps unaided: much training and some maturity are needed for the correct and independent prosecution of a thorough-going investigation through all its many parts. It is my personal belief that a student's capacity to carry out a thorough investigation independently is not so well developed by the abstract study of formal logic, in which the necessary mental processes are described and defined but not performed, as by the concrete study of scientific problems, in which the method of reaching results, and not chiefly the results reached, is explicitly set forth, with practical exercises in graded problems; in short, by what Gilbert has called "the inculcation of scientific method by example."

The Danger of Error. All the mental processes above named may involve error, from observation at the beginning to judgment at the end. The observation of facts may be inaccurate, either from carelessness or incompetence; and it may be misleading by the unwitting introduction of inference along with fact. For example. the term delta ought not to be used in a purely observational record regarding a flat lowland at a river mouth, because delta implies not only such a certain kind of land form, but also the inferred action of unobservable past processes in producing it. It may be that the inference here implied is well grounded and that the explanatory term, delta, is fully justified; nevertheless it does not represent mere observation of visible facts. Indeed few scientific observers are so careful in this matter as was a distinguished Senator from Iowa, who on hearing a friend remark, "Those sheep

have been sheared lately," said: "Well, I should hardly care to assert so much as that, but they certainly do look as if they had been sheared on this side."

Again, the comparison and generalization of groups of apparently similar facts may be premature or hasty or unwarranted, if the facts thus brought together are scanty, or are not really homologous; this would be the case if the valleys of the Cévennes were grouped with the glens of the Scottish Highlands, for the first have their tributary valleys entering the main valleys at accordant levels, while the second do not; or if the branching embayments of Devonshire and Cornwall were grouped with the fiords of Norway, for the branches of the embayments gradually increase in depth to the embayment axis, while the branches of the fiords do not. Further, the spirit of inquiry may be repressed, as if it should not be given liberty until all observational work is finished; and under this belief Darwin seems to have been censured by some other students of coral reefs, because he began to wonder about these curious forms and actually invented his theory of their origin while he was in South America, where he had been led "to reflect much on the effects of subsidence," before he had ever seen a true coral reef!

The invention of hypotheses may be badly grounded on an incorrect or an imperfect knowledge of pertinent principles, as when a shallow synclinal depression was suggested to account for the southwest course of the Severn, in ignorance of the retrogressive development of such rivers by headward erosion along belts of weak structures; or an invented hypothesis may be wrongly constructed on an inadmissible combination of processes, as when it is sought to explain the hanging lateral valleys of the Alps by the greater activity of normal erosion in the wide-open main valleys; or invention may sluggishly cease when only one hypothesis has been invented, although evidently enough the first one may not be the true one, as when it was suggested that atolls were built on submerged crater ruins. The deduction of consequences may be illogical, as when it is inferred that the rivers of an uplifted and gently inclined peneplain will be new-formed and will take directions consequent upon its inclination, whereas they will really persist in their former courses although revived to new activity; or incomplete, as when, in the discussion of Alpine lakes, fifty years ago, the geographers and geologists who opposed glacial erosion, did not perceive that lakes formed by the warping of normal val-

leys must have lateral embayments, and left the deduction of this essential and highly significant consequence of their theory to a clear-minded zoologist. Indeed, deduction and all the other remaining processes may be unwisely omitted by an inventor who is so charmed with the apparent success of his first-formed outline of an hypothesis that he at once accepts it, without demanding that it shall do anything more than explain the facts that it was made to explain. The confrontation of deduced consequences with observed facts may be so unfairly forced as to bring about apparent agreements where none really exist. The revision of all the preceding steps with the intention of making up omissions, correcting errors, and amending inventions, may be opposed by too rigid a habit of mind, or unduly hurried by an impatient desire to finish an investigation. Final judgment may be warped by prejudice or preference, or prematurely announced in the wish to settle upon a deeision. The path of the investigator is beset with dangers!

Safeguards against Errors. The danger of making errors in any of the steps here catalogued may be lessened by a recognition of their nature, by practice in correctly conducting the successive steps of an investigation, and by the conscious use of appropriate safeguards. Observation becomes more trustworthy if carefully made by a trained, keen-eyed observer, who consciously strives to exclude prepossession and inference from his examination of facts, and who scrupulously keeps his record of facts separate from his invention of explanations. Comparisons and generalizations will be properly formulated by an experienced and conscientious investigator, who patiently assures himself of the essential similarity of the facts that he classes together, who prudently refrains from generalizing on too narrow a basis, and who impartially averages the values of common elements; it was a great merit in A. Agassiz' studies of coral reefs that he insisted on their many diversities, and demanded a large collection of facts before generalizing upon them. The spirit of inquiry ought never to be stifled, although its fancies ought to be carefully held apart from the observation and the generalization of facts. Darwin's spirit of inquiry and invention was ever active, for he wrote in regard to hypotheses: "I cannot resist forming one on every subject" (Life and Letters, Vol. I, p. 103). Perhaps his word, resist, as here used, reflects the objection to lively inquiry and fertile invention that is sometimes expressed by would-be cautious investigators; but they should read Playfair, who over a hundred years ago wrote: "It would, however, be to

argue strangely to say, that we must wait till these discoveries are made before we begin any theoretical reasoning . . . . . Such conduct would not be caution, but timidity, and an excess of prudence fatal to all philosophical inquiry" (Illustrations of the Huttonian Theory, 1802, p. 524).

Invention is peculiar in being largely an unconscious process that suddenly awakes, ejaculating "Eureka." Darwin said regarding one of his problems: "I can remember the very spot in the road, whilst in my carriage, when to my joy the solution occurred to me" (Life and Letters, Vol. I, p. 84). But invention should not cease with its first product; it should be spurred on to produce several hypotheses, not merely because the first one may not be right, but even more in order to prevent the growth of over-fondness for the first-born by insisting on a fair treatment for its younger sisters. It is evident that invention will be more successful in a mind that is well stored with previously acquired pertinent information, ingenious in arranging old knowledge in new combinations, and fertile in bringing forth many diverse possibilities. Deduction, unlike invention in being more largely a conscious process, is like it in depending to a great measure on wide acquaintance with pertinent principles, and on a logical capacity to work out sequences from the interaction of various processes under diverse conditions; it must be perseveringly pursued to the detailed definition of many peculiar consequences for every invented hypothesis, and the contrasted consequences of rival hypotheses should be searched out with especial care. The later part of Playfair's paragraph, cited above, touches this case: "The truth, indeed, is, that in physical inquiries, the work of theory and observation must go hand in hand, and ought to be carried on at the same time, more especially if the matter is very complicated, for there the clue of theory is necessary to direct the observer."

Confrontation of the sets of consequences deduced from rival hypotheses with the facts determined by observation must be deliberate, unconstrained and searching, in order to select from among the various competing hypotheses that one of which the consequences are the best counterparts of the facts. Especial attention should be paid to examples of facts for which no matching consequences have been deduced, and to consequences for which no matching facts have been observed. Revision cannot be properly performed without open-mindedness, and this mental quality should lead to the exclusion of such words as "grant," "admit," and "con-

cede'' from such investigations as are here discussed as carefully as they are excluded from geometrical demonstration. Revision should moreover be applied to every stage of progress; observation should be resumed to see if the mates of deduced but unmatched consequences really do exist; comparison and generalization should be renewed whenever new facts are found; invented hypotheses must be modified wherever modification will lead to more successful confrontation, and therefore every invented hypothesis should be conceived as an elastic, not as a rigid scheme; deduction must be repeated to see if the mates of observed but unmatched facts may be fairly found. Darwin wrote: ''I have steadily endeavored to keep my mind free, so as to give up any hypothesis, however much beloved . . . . . as soon as facts are shown to be opposed to it. Indeed I have had no choice but to act in this manner, for with the exception of the Coral Reefs, I cannot remember a single first-formed hypothesis, which had not after a time to be given up or greatly modified'' (Life and Letters, Vol. I, pp. 103, 104). Judgment calls for fair-mindedness, with no shadow of preference or of special pleading; it demands also a practiced willingness to suspend decision in doubtful cases, and to reverse an early decision that is later found to be wrong. When Lyell learned Darwin's theory of coral reefs, he wrote to a friend: ''I must give up my volcanic crater theory forever, though it cost me a pang at first, for it accounted for so much . . . . . . all went so well with the notion of submerged, crateriform and conical volcanoes . . . . Yet in spite of this the whole theory is knocked on the head, and the annular shape and central lagoon have nothing to do with volcanoes, nor even with a crateriform bottom'' (Life of Sir Charles Lyell, Vol. II, p. 12).

Indeed if proficiency in every part of the mental technique of scientific investigation is best gained by exercise of the appropriate mental faculties, it may be contended that, just as it is surely advisable for a teacher not to inform any of his students so fully that they have no chance to exercise the faculty and to experience the joy of inventing solutions for their problems, so it is *almost* worth while for a teacher to lead his more advanced students to accept for a time an erroneous theory, in order that they may later go through the profitable experience—even ''though it cost a pang''—of being logically compelled to give it up when it is, as Lyell said, ''knocked on the head''; for the probability is great that in their later life they will repeatedly have need to use the mental mobility

thus acquired. The maintenance of a suspended judgment also requires practice; the return to the unsettled state of mind that suspended judgment involves is not easy even for the best disciplined investigator, especially if he has enjoyed for some time, perhaps for many years, the contentment of a settled conviction; but a striking example of such return is found in the change from a glowing commendation of Darwin's theory of coral reefs written by Sir A. Geikie in 1882 to an explicit uncertainty about it in 1885. The commendation states that Darwin's explanation of coral reefs is "a theory which for simplicity and grandeur strikes every reader with astonishment. It is pleasant, after the lapse of many years, to recall the delight with which one first read the *Coral Reefs,* how one watched the facts being marshaled into their places, nothing being ignored or passed lightly over; and how, step by step, one was led to the grand conclusion of wide oceanic subsidence. No more admirable example of scientific method was ever given to the world" (Charles Darwin: Nature Series, 1882, p. 17). The subsequent uncertainty seems to have been occasioned by the announcement of alternative theories and reads as follows: "That the wide-spread oceanic subsidence demanded by Darwin's theory cannot be demonstrated by coral reefs must now, I think, be conceded" (Textbook of Geology, 1885, p. 454). The same competent critic wrote some years afterwards regarding the theory of subsidence: "It has been to myself and to many other geologists a matter of keen regret that this brilliant generalization of the great naturalist has been deprived of the wide application which for many years we attributed to it." (Charles Darwin as Geologist, 1909, p. 36).

The Nature of Proof. It may be fairly remarked that the successive steps of an investigation, with their attendant dangers and their reassuring safeguards as here outlined, are all familiar matters, because they have been duly set forth in text-books on logic and elsewhere. They are indeed hardly more than truisms to investigators who are fully familiar with them, and if all observers of coral reefs had been trained to full familiarity with them, there would be no need for a home-student to undertake a comparison of actual methods of investigation with a generalized method, such as is here proposed. But, singularly enough, many observers of coral reefs have not, if one may judge by their published articles, been familiar with the generalized method here set forth—or if they have, their work does not show it, for essential steps are omitted.

A stay-at-home inquirer must therefore often remain unsatisfied with their discussions; he can accept an observer's conclusions only if the observer's investigation is thoroughly carried through all the mental steps from observation at the beginning to proof at the end. What, then, is the nature of the proof which must be demanded before a conclusion should be regarded as demonstrated?

Adverse judgment must be rendered against an hypothesis when its consequences are contradicted by the facts. Judgment must be suspended when an hypothesis does not account for all the facts, or when two or more hypotheses succeed equally well in accounting for them. Favorable judgment must be rendered when, the facts to be accounted for being numerous, wide-spread, varied and peculiar, the apparently successful hypothesis involves only well ascertained principles, when its deduced consequences are even more numerous and peculiar than the facts, when the first confrontation of the consequences with the appropriate facts leads to repeated and striking agreements whereby the facts are seen to possess reasonable and orderly relations not noticed before, when continued observation and confrontation discovers new facts for which no matching consequences have been deduced but for which good matches are found when the invented hypothesis is properly modified or the deduction of consequences is carefully revised, when still further confrontation shows certain consequences for which no matching facts have been observed but for which good matches are found of their predicted kind and in their predicted place after observation, thus guided, is repeated; and when all these tests are successfully applied by many observers in various localities through a long period of time. The four chief lines of proofs of a theory may be briefly named: replacement of unmeaning disorder by reasonable system, capacity to explain new facts, prediction of unnoticed facts, and survival after long-continued, wide-spread scrutiny. Each line of proof is good, but all ought to be successful, before a theory deserves full confidence. After all these requirements have been completely fulfilled the sane mind refuses to remain in doubt; it adopts the successful hypothesis, which thus takes the rank of an established theory, and even though the theory be only a figment of the imagination it is then regarded as supplying the true counterparts of the invisible realities inscrutably hidden in underground structures or irrecoverably lost in past time.

The Class of Readers here addressed. The explicit statement of all these truisms involves delay in reaching our main subject, and

indeed the impatient reader may regard so elaborate an introduction as unnecessary and hasten on to the discussion of the theories of coral reefs, without stopping so long in preparing for the discussion. Let it therefore be explained that the outline of this essay was prepared as an address to university audiences, and that on its delivery at Oxford and Cambridge Universities in November, 1913, the introduction seemed as novel to the groups of British scientific students there gathered as it had previously seemed to audiences of American students at Harvard, Columbia, Ohio and Michigan Universities. The reason for this is probably to be found partly in the responsibility felt by teachers to give a large body of information to their students, so that little time is allowed for the presentation of the methods by which the information is reached; and partly in the difficulty of securing even from graduate students the closeness and the duration of mental attention necessary for the real appreciation of scientific method. This essay is therefore addressed, not to university students in general, but to the more earnest students among them, as well as to scientific readers in general, who have the ambition to become critical as to the sufficiency of scientific investigations, who are interested in the origin of coral reefs as well as in many other problems, and who may wish to form, each for himself, a carefully systematized method of procedure.

Facts of Observation and Facts of Inference. Although this essay is concerned largely with the existing features of coral reefs, it involves the consideration of past processes, and it is, to that extent, geological. Hence it must be noted that geological science is more largely made up of the imagined counterparts of invisible past realities than of observed present realities; indeed most geologists do not stop to distinguish between what may for them be called "facts of inference," and "facts of observation." As examples of "facts of inference," regarding which discussion has ceased because it seems unprofitable, we may mention: the extension of strata through a hill between outcrops traced around the hill sides; the gradual deposition of sedimentary strata, part by part; the successive deposition of superposed strata; the lapse of unrecorded time at an unconformity; the organic origin of fossils; the movement of displacement on faults; the former fluidity of prehistoric lava flows; and so on through a long list. All of these inferences have been so abundantly tested that they are accepted as verities.

A few lines may be allowed in order to recall the fundamental

assumptions upon which all such investigations as are here considered must be based. Chief among these is the continuity of time and the persistence of the order of nature through the remote past. No conclusions regarding past processes are any safer than these unprovable assumptions; but the assumptions and the conclusions are so consistently confirmed by all facts of observation, that, in accordance with the teachings of the school of philosophy lately called pragmatic, they are accepted as true; that is, the entire scheme of earth-science thus built up, when tried by many men in many places, by many tests at many times, is found to "work"; therefore the elements of the scheme are believed to be the counterparts of the invisible, past realities of the world.

Facts Concerning Coral Reefs to be Accounted for. The facts of observation and the associated generalizations, which have to be accounted for by a theory of coral reefs, are chiefly: the distribution of reefs—this important matter is summarized in an admirable series of recent charts, "Cartes des bancs et récifs de coraux," by Joubin (4 sheets, 1:10,000,000, Paris, 1912); the surface forms and structures of those masses known as uplifted reefs, fringing reefs, barrier reefs, and atolls, and the relation in which the uplifted, fringing and barrier reefs stand to the enclosed islands or to the neighboring mainland; the occurrence of living corals chiefly on the outer side of the reefs above depths of twenty or twenty-five fathoms; the shallow lagoons enclosed by barrier reefs and atolls and the nature of their bottom deposits. Among the "facts of inference" which will be here accepted without discussion are: the organic origin of the under-mass of coral reefs, the great thickness of which has been proved in a few cases by borings; the volcanic origin of the mountainous central islands within many fringing and barrier reefs, regarding which an excellent though brief summary is given with abundant references to detailed articles, in P. Marshall's "Oceania" (being Part 5, Sect. 1, Vol. 7 of Steinmann-Wilckens' Handbuch der regionalen Geologie, Heidelberg, 1912); and the geologically modern occurrence of a "glacial period." Pertinent items of related knowledge concerning the colonization of new volcanic islands or of uplifted shore lines by floating coral larvæ, the manner of growth of corals and of other organisms found on the reefs, in the lagoons, and in the sea around them, and the limiting depths and temperatures at which these organisms live; the formation of oölitic, calcareous deposits and the possible solution of such deposits by sea water; the effects of

winds, waves and currents on reefs; the characteristic changes of form produced by normal and by marine erosion of volcanic islands; the changes brought about by movements of elevation and subsidence, either in the sea itself or in the sea floor and the islands that rise from it; and the evolution of insular faunas and floras.

Theories of Coral Reefs. The more important theories of coral reefs, arranged in order from the simplest to the most complicated, are listed below. For conciseness of statement, only oceanic reefs are here considered; explicit mention is seldom made of reefs on continental borders, for such cases may be treated as large islands.

1. The formation of atolls on the rims of slightly submerged volcanic craters.

2. The upbuilding of a still-standing submarine bank to a moderate depth, by non-coral organic deposits, and then to the surface by corals and associated organisms, thus forming an atoll, which may afterwards be enlarged by outward growth of the reef, on its own talus, while the lagoon is enlarged by solution.

3. The establishment of a fringing reef around a pre-existent still-standing island, the conversion of the fringing reef into a barrier reef by growth on the outside and solution on the inside, and the conversion of the expanding barrier reef into an atoll by the wearing away of the central island.

4. The abrasion of a bench by marine action on a still-standing, pre-existent island, and the establishment of a veneering barrier reef on the outer rim of the platform.

5. The complete truncation of a pre-existent island by marine abrasion, and the establishment of a veneering atoll on its outer rim.

6. Slow subsidence of a pre-existent island, and the gradual transformation of its fringing reef by slow upgrowth into a barrier reef around the diminished central island, and into an atoll over the vanished central island.

7. The subaerial degradation or the marine abrasion of an uplifted reef, or mass of marine limestone, to a platform close to or slightly below sea-level and the establishment of reef-building corals around the outer border of the platform, thus producing a barrier reef or an atoll, according as the uplifted mass had or had not a harder non-calcareous core.

8. Abrasion of a platform on pre-existent, still-standing islands and reefs by the sea while it stood at a lower level during the glacial period, when much ocean water was withdrawn and stored

as ice on the lands, and when the corals of most reefs were killed by lower temperature; followed by upgrowth of barrier reefs and atolls on the border of the abraded platform during the opening of the milder post-glacial period and the restoration of the withdrawn water to the ocean.

These theories will now be considered in order as above arranged:

1. *Atolls Built on Submerged Volcanic Craters.* It was long ago suggested that atolls were built up from the rims of submerged volcanic craters. This theory first came to be regarded as improbable because it postulated the occurrence of many craters of unusual size. No other special consequences were deduced from it, as a means of testing its verity. When it was later learned that reef-building corals could not grow below moderate depths, the theory demanded the further postulate that numerous craters of unusual size should be built up nearly but not quite to the sea surface; and the theory then broke down because of the improbable conditions that it demanded. As a general explanation it was given up "with a pang" by Lyell; it was recognized by Darwin as possible in special cases; A. Agassiz found what he took to be actual examples of atolls thus formed in the Fiji group.[1]

2. *Atolls Formed by Upward Growth on Still-standing Banks.*[2] The next simplest theory of coral reefs is that in which atolls are supposed to be built up from a submarine base or bank, such as a volcanic cone that rises part way to the sea surface from a still-standing ocean bed. As long as the bank does not reach near enough the surface for colonization by corals, it may be built up to the requisite shallowness by other organisms, after which the corals will build their reefs to the surface, and then enlarge the resulting atoll by outward growth on a foundation of their own talus, while the lagoon is enlarged by removal of the inner border of the reef by solution. Various observers have called attention to the action of the dominant winds and currents, in determining the pattern of an atoll by drifting the coral sand around from the windward face to the curved extremities of the reef; but as this action has effect on reefs of whatever origin, it need not be further considered here.

This is evidently an easily conceivable theory, so far as its sev-

[1] The Islands and Coral Reefs of Fiji, *Bull. Mus. Comp. Zool., Harvard Coll.*, Vol. 33, 1899, p. 40.

[2] Sir J. Murray: On the Structure and Origin of Coral Reefs and Islands, *Proc. Roy. Soc. Edinb.*, Vol. 9, 1880, pp. 505–518.

eral postulates are concerned, and its consequences, as far as they are announced, seem to be correctly deduced; but the main postulate of the theory—a still-standing ocean bed—is shown to be improbable by the occurrence of many islands bearing coral reefs at various unequal heights above present sea-level, for this proves that the ocean bed on which the islands stand has not remained fixed but has been unequally uplifted; and further by the occurrence of many embayed islands, in which the embayments are so large as to demonstrate subsidence and not merely a change of sea-level during the glacial period, and this indicates that the ocean bed on which such islands stand has been depressed. Is it indeed not true that all islands, of which the geological history through Tertiary and later time has been deciphered, show many changes of level? The island of Sumbava, studied by J. Elbert, is too near a continent to be taken as a type of an oceanic island, but it certainly seems to have suffered repeated movements of elevation and depression since Miocene time.[3]

Furthermore, certain essential consequences of this theory as to the submarine structure of atolls have not been emphasized by its authors; for example, the moderate thickness of the central, horizontally bedded lagoon limestones, in so far as they are of shallow-water accumulation, and the great volume of peripheral talus deposits with which the central beds should be surrounded in large, old atolls. Brief mention, or the mere implication of such consequences, was perhaps regarded as sufficient because they are so manifest, or perhaps because the corresponding facts are inaccessible; yet the consequences are of importance in preparation for the study of uplifted coral islands. In the absence of detailed information regarding the structure of such islands—information that may be difficult to secure because of the alteration of their limestones by re-solution and crystallization, as well as by reason of insufficient dissection by valleys and of excessive obscuration by stalactitic deposits and by vegetation as Andrews found to be the case in the Fiji Islands[4]—there is no independent confirmatory evidence to show that this theory provides the counterparts of the facts.

There is one element of the theory which appears to be contradicted by the facts; namely, the origin of the lagoons of atolls by

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[3] Die Sunda Expedition, Vol. 2, 1912, pp. 132-174.

[4] E. C. Andrews: Notes on . . . the Fiji Islands, *Bull. Mus. Comp. Zool. Harvard Coll.*, Vol. 38, 1900, p. 12.

solution of the earlier formed, inner rings of reefs. The inner edges of certain atoll-reefs appear to be suffering solution; but the lagoon bottoms do not show either the ragged forms that solution should produce, or deposits of insoluble residues that should remain after solution; the best studied lagoons appear to be receiving new organic deposits. Observations made at Funafuti are especially significant on this point: a great part of the lagoon bottom there is "covered with a dense growth of a green calcareous alga," which "forms a living carpet"; "this mass of vegetable matting has a remarkable resemblance to a peat bog. The upper surface is green and living, but below the mass is dead and decaying."[5]

The important share that bacteria may take in causing the precipitation of calcic carbonate from solution in sea water and the large volume of oölitic limestone that is formed from the resulting calcareous mud have been emphasized by recent observers, especially by Vaughan, whose recent studies, based on chemical analyses of the sea water in reef lagoons, disprove the origin of lagoons by solution.[6]

One of the most important postulates of this theory is that a deep, still-standing bank may be built up to small depth by non-coral organic deposits, either living there or falling in an "organic rain" from near the sea surface; and this is of particular interest, as having been shown to be possible some forty years after Darwin announced his theory of subsidence. That submarine banks actually are built up in this way is thought to be proved by certain dredgings, as in the Seine and the Dacia Bank in the Atlantic off the coast of Morocco, and elsewhere;[7] but the proof does not seem to hold: the mere occurrence of non-coral, organic deposits on such a bank does not demonstrate it to be still-standing; it may be subsiding faster than it is built up. Independent evidence, showing that this possible explanation is a true and actual explanation, is wanting and must long remain wanting, because the facts that might provide such evidence are inaccessible. If borings should show that certain atolls have a thickness of only twenty fathoms of coral and lagoon limestone, formed in greater or less part of corals

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[5] The Atoll of Funafuti, Royal Society, London, 1904, pp. 177, 180.

[6] T. W. Vaughan: . . . On the Formation of the Floridian and Bahaman Oölites, *Journ. Wash. Acad. Sci*, Vol. 3, 1913, pp. 302-304; and, Sketch of the Geologic History of the Florida Coral Reef Tract, *ibid.*, Vol. 4, 1914, pp. 26-34; see p. 27.

[7] J. Y. Buchanan: On Oceanic Shoals Discovered by the SS. "Dacia," *Proc. Roy. Soc. Edinb.*, Vol. 13, 1885, pp. 423-443.

Sir J. Murray: Balfour Shoal, a Submarine Elevation in the Coral Sea, *Scott. Geogr. Mag.*, Vol. 13, 1897, pp. 120-134.

in place around the margin and of lagoon muds in the center, beneath which a volcanic foundation, or an organic cap on a volcanic foundation, were penetrated—or if similar structures were found in uplifted and dissected atolls—the theory would receive strong support; but until then, it affords only a permissible, not a compulsory explanation of atolls. If the horizontally bedded coraliferous "cover" of an atoll were found to be thicker than twenty or twenty-five fathoms, and if cross-bedded beach or dune sands, and layers of guano, were found beneath the surface, subsidence would be indicated. These are matters for future study. The present capital fact that independent evidence of subsidence is found in many neighboring barrier-reef islands makes the origin of atolls on still-standing foundations improbable, to say the least.

This theory therefore stands in an uncertain position—possibly true but not probably true, and not shown to be actually true in a single case. The leading facts which the theory seeks to explain are well generalized; the theory is ingeniously contrived so as to combine various reasonable processes; but its main postulate of a still-standing bank is improbable, in view of the abundant evidence of elevation or of depression, or of both, in oceanic islands where such evidence is visible; the consequences as to reef-structure cannot be tested because the corresponding facts are invisible. Judgment must therefore be suspended.

(*To be continued*)

GEOGRAPHICAL STATISTICS

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Under the date July, 1913, the Handels-statistisches Amt of Hamburg issued a volume of 368 pages filled with detailed statistics covering the over-sea trade of the port. At first glance, an amount of figures such as are here included often appals the reader. However, close inspection reveals a very careful arrangement of intelligible tabulations. Inasmuch as the effect of the "glance" quite often precludes any further study, these volumes are usually relegated to the shelves for possible future reference merely. The writer sees very large possibilities in these statistics and is of the

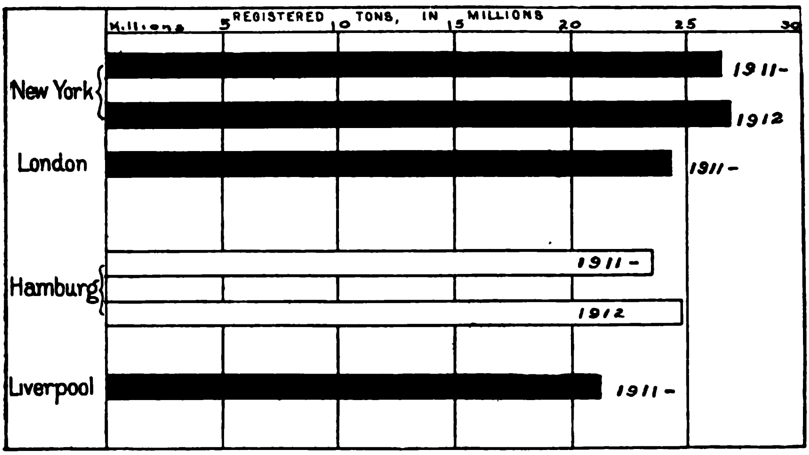

FIG. 1—The rank of Hamburg among the ports (in registered tons), exclusive of coastwise and river traffic.

belief that they should arouse a lively interest in and receive a cordial welcome from every geographer. With the desire to help stimulate greater activity in the more widespread use of statistics and, perhaps, to present a little material that will suggest some ideas worth while, a brief review of this report is attempted.

The volume is divided into four main parts as follows:

Introductory a—General review of the trade of the port for a series of years.

I. Navigation: a—Ocean Traffic; b—River Traffic.
II. Trade: a—Imports; b—Exports.
III. Review of Miscellaneous Facts: a—Emigration via Hamburg; b—Marine Insurance; c—Banking and Money Exchange.

The figures in the tables in Part I impress one with the immensity of the traffic in the harbor. At once the question arises as to Hamburg's rank among the world's harbors. Figure 1 indicates her as third in rank in *foreign* trade. These figures are exclusive of coast-

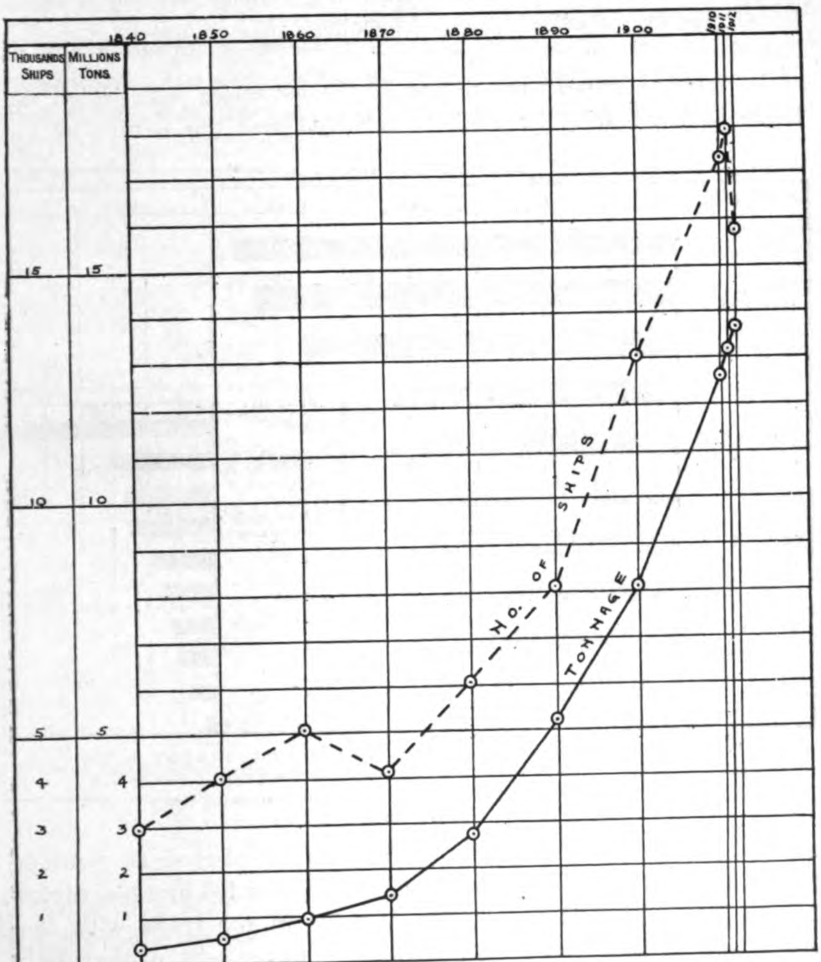

FIG. 2—Increase in ship tonnage of Hamburg.

wise and river traffic. Although the tonnage of the other ports shown in Figure 1 is not included in this volume the data are readily available.[1]

Our interest does not stop with a knowledge of her present

[1] Statistical Abstract of the United States; Statesman's Yearbook; reports of the respective chambers of commerce, etc.

importance but extends into the question of her rapidity of growth as a world port. Figure 2, based upon the report, indicates not only a rapid rise in tonnage but an increase at a quickening rate. Studies of fluctuations in the curve representing number of ships, of the relation of this curve to that representing tonnage, and other situations introduce a whole series of problems that cannot be here discussed.

In Part II appear the names of the countries with which the trade is conducted, the harbors involved and the nature of the

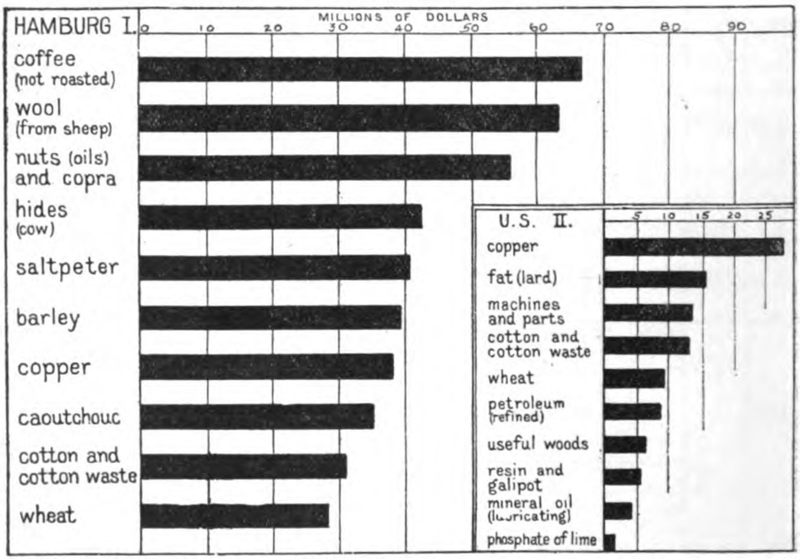

Fig. 3—(I) Ten leading products among 459 imported into Hamburg in 1912; (II) ten leading products among 408 imported from the United States in 1912. Both graphs show values in millions of dollars on same scale.

exports and imports. A few striking facts selected at random follow, to suggest the extensive opportunity afforded by these tables for studies in distribution. The tonnage in the trade with the Argentine in 1912 was practically equal to 40 per cent. of that with the United States; the difference in the amount of wheat imported from these two countries was only $158,330 in favor of the United States (see Fig. 3 for United States exports to Hamburg). In the trade with the United States, the port of New York ranks first, above Philadelphia, while Baltimore as third precedes Boston. The articles of import into Hamburg total 459 and those of export 441. The quantities and respective values for each are detailed. Then

follows a careful analysis of the total trade in these products to show with what countries business was done. Added to the itemized statement for 1912 is a summary for each year from 1909 to 1912 inclusive.

But this is not all. The articles themselves are alphabetically arranged and the countries involved in their exchange listed underneath each. The amounts and values for the trade in 1911 and 1912 respectively complete that tabulation. Figure 3 illustrates only one

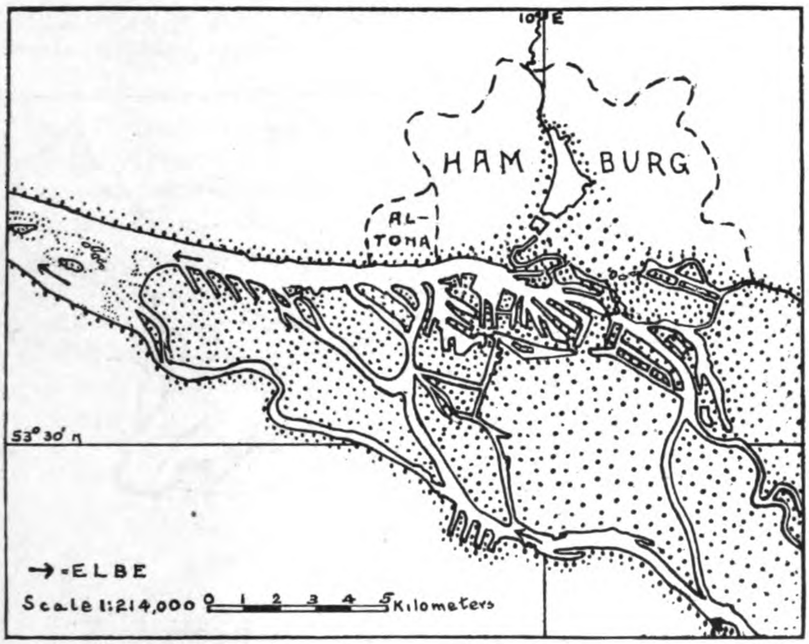

Fig. 4—Sketch map of Hamburg Harbor.
(Based on the Diercke Schul-Atlas and other sources.)

manipulation with these figures, of many that are possible. The ten products representing the largest total values in the imports from all countries have been ranked and, for comparative purposes, the ten products representing the largest total values in the imports from the United States have been ranked and drawn on the same scale. Three of the ten articles that lead in the Hamburg trade come from the United States in large part, namely copper, cotton and cotton waste, and wheat. While these rank seventh, ninth and tenth respectively in Hamburg's total imports, they rank first, fourth and fifth in the imports from the United States. Of the

$38,000,000 of copper imported by Hamburg, $28,000,000 (73 per cent.), or nearly three-quarters, came from the United States; of the $32,000,000 of cotton and cotton waste imported by Hamburg, over $13,000,000 (37.5 per cent.), or more than one-third, came from the United States; although Russia is not far from Hamburg, over $9,000,000 (33⅓ per cent.), or one-third of the $27,000,000 of wheat, was imported from the United States. There seems no end to the many interesting and significant relations that may be uncovered and the subsequent discussion that may be developed therefrom.

The analysis of the commerce as carried on in ships navigating under the flags of the various nations brings to light the almost

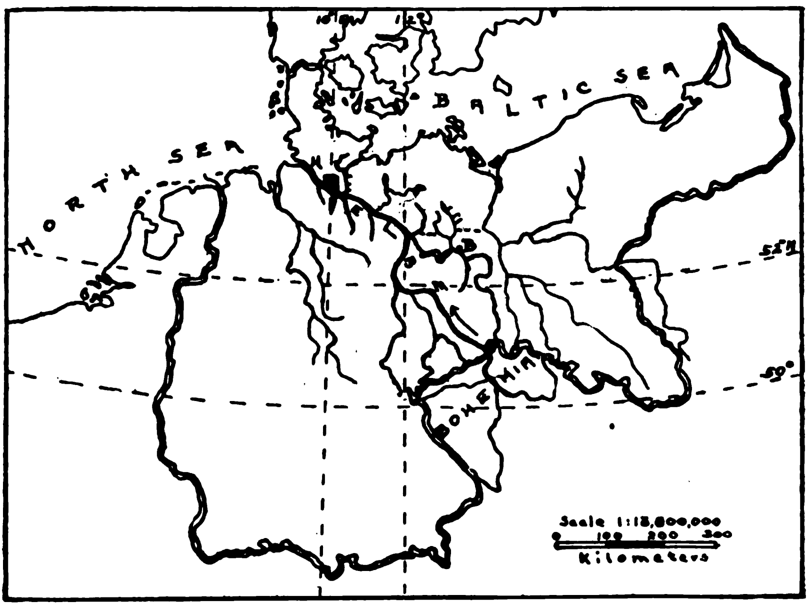

Fig. 5—Sketch map to show Hamburg and the Elbe system.
(Based on map in Hettner's *Grundzüge der Länderkunde*.)

pitiful sight of only an average of two ships per annum under the flags of North American countries, including the United States, during the twenty-year period from 1891 to 1910; and absolutely none since 1910. On the other hand, the almost overwhelming figures for the trade in ships flying the German flag presents a remarkable contrast that needs explanation. In 1912, 9,716 ships totaling a tonnage of 7,947,670 carried the imports to Hamburg. The British flag floated over 3,398 ships that entered Hamburg and totalled 4,037,900 tons.

The statistics indicate Hamburg's supremacy as a port over all other German ports. The reason is at once sought. Aside from any artificial factors that may be involved, it seems apparent from Figure 5 that its location is the primary factor. It is situated at the head of an estuary which initially possessed good conditions for an excellent harbor accommodating practically all small craft. Subsequently, with increase in traffic and size of boats, it lent itself readily to dredging and enlarging. Again it is at the focal center of the navigable Elbe, its tributaries and intersecting canals, that drain through the vast plain of northern and central Germany and concentrate the directions of the avenues of trade.

It is quite impossible to discuss at length in this paper the figures so clearly and admirably presented in the report under consideration. Perhaps some suggestions have been thrown out in this brief survey. In any event, such a valuable group of data ought to receive as much attention and interpretation as any other contribution to geographical information. In fact one must recognize that, after all, figures form the basis for most reliable discussions. If geography is ever to be included within the sphere of the "exact sciences," or even make a close approach, it must be founded, in part at least, upon definite works such as the delightful and welcome report of the Handels-statistische Amt of the Hamburg Chamber of Commerce.

THE INFANCY OF SPEECH

By WILLIAM CHURCHILL

Philology, after its first gropings to establish the method and its half century of establishing the fatherhood of the modern languages, has been halted at the irreducible primitive elements which it has discovered. The most recent activity has been expended upon classification and the correction of systems. The inquiry into the beginning of the speech of man was blocked by the speech of beginning man, the root, as the result of diligent analysis. Below the root nothing could be imagined. The lines of inquiry led to nothing more primitive, therefore inquiry was brought to a stop.

The root as the ultimate of philological study of the higher languages is a vowel or a combination of vowel and consonant. Illustrating by the use of A as the type of all vowels, M as the type of all consonants—and they are so early in evolution that they may stand for the parents of all of their class—the root possibilities are reducible to A, MA, AM and MAM. Of these A is common to man and vocal beasts, the last three are the sole and unique possession of man among the primates, admitting as an at present undetermined possibility that a slight possession of consonant ability may be found among the quadrumanes. At this point we long rested; although we recognized that a purely vowel root might exist with its charge of meaning it was accepted as beyond peradventure that the root in which the consonant is involved is insusceptible of further reduction.

Now comes a most important discovery out of Africa to assail this position. We have a brilliant analysis of the speech of the Pangwe,* a language poised on the threshold of agglutinating speech, that is to say one step above the isolating or most primitive type of speech. We cite in full a translation of Mr. Tessmann's carefully prepared statement.

"The stem of the present day monosyllables consists of consonant plus vowel. We have here three primordial consonants: palatal *k*,

* Die Pangwe. Völkerkundliche Monographie eines westafrikanischen Negerstammes. Ergebnisse der Lübecker Pangwe-Expedition 1907–1909 und früherer Forschungen 1904–1907. Von Günter Tessmann. Vol. 1: xxi and 275 pp. Vol. 2: 402 pp. Maps, ills., index. E. Wasmuth A.-G., Berlin, 1913. Mk. 30, 2 vols. 11½ x 8.

lingual *t*, labial *b*, and three primordial vowels which correspond in signification with the primordial consonants, namely *a*, *i* (*e*), and *o* (*u*). The signification at the point of origin lies as follows: with the combination *k-a* in the evaluation of the idea expressed by the word; with *t-i*(*e*) in its property; with *b-o*(*u*) in its relation. The primitive association between thought and sound may thus be stated:

"1. Evaluation: anything which arises outside of my will yet which may be brought by me into harmony with my view; anything which opposes me as something hostile, or which I oppose; destiny; the past.

"2. Property: anything which at the present moment is neutral to me, neither hostile nor friendly; the present.

"3. Relation: anything that I wish or that repays my effort, my direction or my choice; what is in a friendly attitude toward me or to which I am friendly; inclination; the future.

"Warning of danger, for example, is an evaluation, therefore the gutturals of the warning apes, to which corresponds in origin the exclamation *ka* of the Pangwe expressing astonishment or alarm. The wish to possess an object is a relation, and we find it among the anthropoid apes on the edge of the lips and among the Pangwe the same. When one points at an object in order to possess it the pointing of the finger does not signify relation but an evaluation in a hostile sense or a property, and in common intercourse is held unbecoming."

Mr. Tessmann develops his thesis with great accuracy and with abundance of material proof, but we need here go no further than the foregoing statement. It will be seen that he has established sense-classes in the primitive root and that he has implied a speech community with the anthropoids. As a conclusion from investigation based on a speech which has already reached the second stage this is as far as the student may venture. None the less it is a triumph in that it has passed beyond the barrier of the hitherto irreducible root.

Tessmann is entitled to the fullest credit for his discovery. It is the product of his own fresh research. He deserves to rank among the pioneers of the new philology, that enthusiastic band devoted to the establishment of human speech as an integral chapter of the evolution of man. He is its second member.

In this science I have established a priority of no more than eight years. I would not in the least detract from the credit of

the present discovery. My only advantage was that I began my studies upon speech yet more primitive, the isolating languages of Polynesia, and therefore made a start nearer the goal than the Pangwe agglutinants could afford. In a prolegomenon to this great topic I published a paper on "Root Reducibility in Polynesian" (*American Journal of Philology,* Vol. 27, p. 369). The sum of my conclusions was then that the vowel in speech, shared by us with the animal in its sense-expressive cry, carries the general sense of position in place and time relative to the speaker, to which manner is added by a growth in the controlled employment of intonation, and that the consonants which man alone possesses as modulants of the vowels have a coefficient value which particularizes the sense generalized in the vowel member of the root. I may say that continued research has confirmed and enriched the conclusions at which I then arrived.

A great value of this determination in the Pangwe lies in the fact that Tessmann was wholly unfamiliar with the earlier discovery and therefore reached his conclusion without prejudice. His was the distinct advantage that when he was conducting his investigation he was able to compare face to face the Pangwe with their fellow citizens of the trees, whereas in the Pacific study I was in the position of estimating the speech of anthropoids by inference. Tessmann has not ventured upon so broad a treatment as that in which I felt justified by the data upon which I worked, therefore his result is stated in more particular terms. But that result is the same. Primordial man has the use of vowels through his inheritance of the wholly vocalic animal cry; he is acquiring the closures of the mouth organs out of which he may develop a fine array of consonants to serve as modulants of the diffuse vowel significations.

Disregarding the question of priority, regarding the result of independent inquiry as the strongest measure of corroboration, it is a distinct pleasure to welcome Tessmann as an equal pioneer to the philology of the beginning man. For we need such arguments in order to convince formal and systematic philologists that the next great advance in the science is to be made through the tongue of the savage man who lives nearest the animal.

THE PERIOD OF SAFE PLANT GROWTH IN MARYLAND AND DELAWARE*

By OLIVER L. FASSIG

It is customary to establish the period of safe plant growth for a locality by determining the average dates of the last killing frost in spring and the first killing frost in fall, for the locality in question; the length of the intervening period may be regarded as the mean frostless period. When a temperature of 32° or below occurs without the occurrence of frost during a critical period after plant activity has begun in the spring, or in the early fall before the crops have all been gathered, the date of occurrence of the last and first temperature of 32°, respectively, is substituted in place of a killing frost in determining the average dates of the last and first frosts. The occurrence of frost does not generally coincide with the occurrence of a temperature of 32°, owing to the custom of exposing the thermometer in a shelter several feet above the ground. The difference between the temperature upon the ground and the temperature within the shelter, about five feet above the ground, may be as much as 10°, the degree of variation depending upon the topography and the weather conditions. As a rule the temperature at the ground is distinctly lower during the night hours than the temperature in the shelter; this condition may be reversed, however. Since the frostless periods based on the last and first occurrence of frost and on the last and first occurrence of a temperature of 32° are not of equal length, the usual method of calculating this period from records made up of both kinds of observations is obviously open to criticism. The use of an occasional freezing temperature to complete a long record of observed frosts is not objectionable, but a frequent substitution should not be resorted to.

In order to learn the extent of the difference in the length of the frostless period, or rather the difference in the length of the period of safe plant growth as determined by means of the two methods described, two distinct series of observations were tabulated and compared for all stations in Maryland and Delaware having a record covering a period of ten years or more. Fortunately, we have in these states a large number of carefully made observations extending over periods varying from ten years to forty-three years. The average length of these records is twenty years, confined mostly to the period from 1890 to 1913. The accompanying table [shown by Mr. Fassig] exhibits the following facts of importance in making a comparison of the two methods of determining the frostless period:

1. The location of all stations having a record of ten or more years.
2. The length of each record.
3. The average date of the last and first killing frost.
4. The average date of the last and first temperature of 32°.
5. The average length of the intervening periods.
6. The average difference in the length of the two periods.

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* Abstract of a paper read at the joint meeting of the American Geographical Society and the Association of American Geographers in New York City, on April 3, 1914. Illustrated by charts.

The tabulated results have also been charted, bringing out more clearly the geographical differences in the length of the periods as determined by the two methods of calculation.

The accompanying table and charts† are interesting and instructive and suggest the advisability of adopting a uniform method of determining the period of safe plant growth, and they also appear to demonstrate the superiority of the method based upon the last and first occurrence of a fixed temperature, for example 32°, over the usual method of observing and recording the dates of the last and first killing frosts in spring and fall, respectively.

Some of the reasons which may be advanced in favor of the method of determining the period from the temperature records are the following:

1. The temperature is observed and recorded regularly, and the record is therefore complete for the entire season.
2. Frost records are apt to be incomplete unless they occur at critical periods in plant growth. This failure to record frosts is particularly noticeable in records of spring frosts; stations having excellent fall records have often a very defective record of spring frosts. Frosts occurring after a long period of warm weather, as in summer or early fall, are likely to be more conspicuous events than the last of a series of many frosts occurring throughout the winter and early spring.
3. In recording frosts there is always a variable personal factor, opinions differing as to the extent and severity of the frost, resulting in the same frost being designated as heavy or killing. In recording temperatures, on the other hand, this personal factor is practically eliminated.
4. There is a fairly fixed and uniform relation existing between the temperature in the shelter and the occurrence of a killing frost in any given locality, and this factor can be readily determined from a comparatively short series of observations.
5. For reasons stated above a reliable "frostless period" may be established for a given locality from a shorter series of observations by the use of a temperature record than by the use of a frost record.

The Maryland and Delaware records, covering an average period of twenty years at fifty stations, show that the frostless period based on the observations of a temperature of 32° is about ten days longer than the period based on the occurrence of killing frosts. This relation holds good for stations in open level places, but apparently does not hold for stations in the mountain districts, where the period based on the occurrence of frosts is about ten days longer than that determined from a record of freezing temperatures in a shelter five feet above the ground.

The necessity of charting these two systems of observations separately is apparent, and I am convinced that the method of temperature observations is the better method. The formation of frost depends not only upon the occurrence of a temperature of 32° or lower, but also upon the relative humidity of the air at the time and place of formation; the temperature may fall considerably below the freezing point for water without the occurrence of frost, in a dry atmosphere. The injury to plants is probably as great in one case as in the other, yet the absence of frost may give the impression that no injury has resulted.

A comparison of the charted results of the two methods shows a similar configuration of the lines of equal frostless periods and of lines showing the

† Only one of the charts is shown here.

beginning and ending of the periods, but the charts based upon the temperature records show greater detail owing to the use of the greater number of stations and the greater average length of the periods of observation permitted by the temperature method.

Nearly all of the temperature observations used in the construction of the accompanying chart were made under similar methods of exposure of thermometers—namely, in standard Weather Bureau shelters, about five feet above the ground, in country districts, or in open places in small towns. Proper allowance must be made for temperatures observed under conditions which differ widely from the usual methods of exposure, such as those made in large cities, like Baltimore and Washington, where the thermometers are exposed upon the roofs of buildings at elevations of 100 feet or more above the ground.

The charts show quantitively what has long been recognized in a general way, namely, the great influence of Chesapeake Bay in lengthening the period of safe plant growth in Maryland. This fact is conspicuous in all the charts.

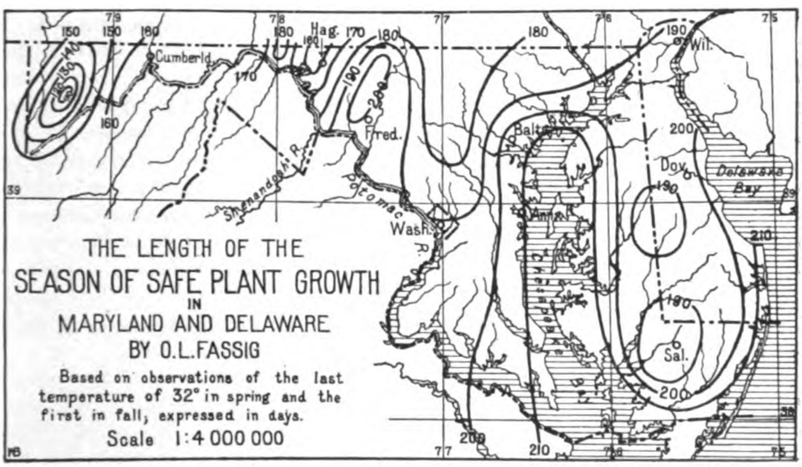

Fig. 1.

The protecting influence of the mountains in the western part of Maryland is also clearly shown in the greater length of the frostless period on the eastern, or leeward side, and in the contrast between conditions on the western and eastern sides of the Blue Ridge Mountains in Washington and Frederick Counties.

The length of the period of safe plant growth along Chesapeake Bay in southern Maryland is longer by nearly 100 days than the period in Garrett County in the mountains of western Maryland.

Taking the average for a long series of years a temperature of 32° or below disappears for the season along the shores of Chesapeake Bay and along the Atlantic coast about April 5; and again makes its appearance in the fall about November 10 or 12, showing a period of safe plant growth of about 210 days. These figures apply, however, only to localities near the shore, the length of the period diminishing rather rapidly with the distance from the water's edge. This protecting influence of the bay is strikingly brought out

in the chart, showing the variations in the length of the frostless period on what is known as the "Peninsula"—the district in Maryland between the Atlantic Ocean and Chesapeake Bay. In the central portions of the Peninsula, farthest away from the bay and the ocean, regions in which nocturnal radiation is more active than in the immediate vicinity of large bodies of water, freezing temperatures do not usually disappear in the spring until April 15 to 20, and reappear in the fall about October 20 to 25, decreasing the period of safe plant growth from 210 days near the shores to 190 days at distances only twenty to twenty-five miles inland, a difference of twenty days.

In the mountain districts of the Blue Ridge we have a striking example of the protecting influence of a mountain range stretching across the path of the prevailing westerly winds. On the western, or windward side of the Blue Ridge, in the lower levels of the Cumberland Valley, the frost period extends into the first week of May and reappears in the fall in the first decade of October, showing a period of safe plant growth of about 160 days; on the eastern, or protected side, of the Ridge the period is lengthened to 190 days, and even 200 days, the freezing temperatures disappearing about April 15 and reappearing in the third decade of October. In the mountain districts the variations in the length of the season are to some extent due to cold air drainage during clear and calm nights, and cannot be altogether attributed to the protecting influence of the mountains against the cold westerly winds.

In the most western county of Maryland we find another factor entering into the length of the period of safe plant growth, namely, that of elevation. The general level of Garrett County is not far from 2,500 feet above sea-level, with peaks rising to 3,000 feet. Here we have a very decided shortening of the period, injurious frosts extending into the early days of June, and appearing again about the middle of September, showing a period of safe plant growth of but little more than 100 days in the areas exposed to intense nocturnal radiation and to extensive air drainage.

The dates and figures quoted, it should be kept in mind, are average values, based upon a long series of years of carefully made observations. The variations from these average or normal values from year to year are of course large, and the extent of variability from the normal dates of occurrence of the last killing frost or frost temperature in spring and the first in fall is a very important factor of the climate of any given locality. A further study of this matter will be made later; the primary purpose of this paper is the determination of the best method of calculating the period of safe plant growth, and the normal length of the period in the states of Maryland and Delaware.

GEOGRAPHICAL INFLUENCES IN AMERICAN POLITICAL HISTORY*

By FREDERICK JACKSON TURNER
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The frontier[1] and the section[2] are two of the most fundamental factors in American history. The frontier is a moving section, or rather a form of society, determined by the reactions between the wilderness and the edge of expanding settlement; the section is the outcome of the deeper-seated geographical conditions interacting with the stock which settled the region. Sections are more important than states in shaping the underlying forces of American history.

The economic, political, and social life of the United States, even its literature, psychology, and its religious organizations must be described by sections; there is a geography of public opinion. In spite of similarity of traits and institutions throughout the nation, it is also a congeries of sections. Political leaders usually gain a national position by first convincing their own section, expressing, as well as leading, its ideals and wishes, and then combining it with other sections under political adjustments.

Political sectionalism exhibits itself most obviously:

1. In a group of states contending with other groups, or with the nation, as in the case of North against South, West against East, or the Northeastern group of Federal states against the rest of the nation. Such a grouping by states, however, conceals interior divisions and needs further analysis.

2. A sectionalism by congressional districts, not confined within state lines, is exhibited by mapping votes in Congress, attributing to the district the views of its representative in the House. Such maps of votes show that party voting is often subordinated to sectional voting; the sections reflect the influence of physical geography as well as of other factors. This method of exhibiting geographical influence is limited by the frequency of the cases where the congressman does not fairly represent the mass of his constituents, as well as by the size of the congressional districts, and by the practice of ''gerrymandering'' the districts in order to gain a party advantage.

3. By mapping presidential and state elections, using towns or counties as the unit, a closer approximation to the geography of political areas is possible. Such maps show more clearly the geographical influence and in greater detail. They disclose the fact that there are both interstate and intrastate party areas persisting in some cases for many decades or even generations and having clear relations to natural geographic factors. But the county itself is too

* Abstract of an address before the joint meeting of the American Geographical Society and the Association of American Geographers in New York on April 4, 1914.

1 F. J. Turner: Significance of the Frontier in American History, *Report American Historical Association*, 1893, p. 199.

2 *id.:* Is Sectionalism in America Dying Away? *American Journal of Sociology*, Vol. XIII, p 661. See also the author's articles on "Frontier" and "Sectionalism" in Hart and McLaughlin (editors): Cyclopedia of American Government (in press).

large an area to tell the whole story. It often lies athwart diverse geographical areas, and has diverse economic and social groups within it.

4. The final refinement of such mapping would be by election precincts which would be a much more satisfactory mode of exhibiting the relations of voting to soils, resources, position, population, etc. But at present this has been insufficiently carried out.

Limitations of the method must be noted. The existence of a minority is concealed, though the vote may be close. Great political changes may occur where a mere plurality is the test without materially altering the appearance of maps of county units, inasmuch as the size of the plurality is not recorded; the city in one corner of a state may outweigh all the varied sections of the rest of the state; even the bulk of a party vote may theoretically lie in the areas not depicted as the areas of this party. Moreover, parties are held together by combining various issues in order to hold dissenting elements, and by stating issues ambiguously; platform and candidate are also sometimes inconsistent. Thus the issue for which a geographical interpretation is sought may be confused, if the question is one of political opinion rather than of party habit.

The method, therefore, has its special value in revealing the party inertia of geographical areas rather than in its use for the natural history of political parties, as organizations, though it is also useful in this respect. By mapping votes by percentages, as in the presidential election of 1880, mapped in *Scribner's Statistical Atlas,* many of these objections may be met. Such a system, however, confirms the general correctness of the coarser reconnaissance system of mapping by pluralities used in illustration of the present paper. Areas of transition and of political instability are brought out more clearly by percentage mapping but the more durable and pronounced political areas remain substantially the same under both systems. In other respects also the limitations noted in theory are not so important in practice as they might seem.

Conceding the limitations of the method, it nevertheless reveals a most significant geographical influence in American political history which needs further study.[3] The series of maps illustrating the various modes of mapping described above show that geographical influence exists both in regard to the groups by states, and in groups by lesser units. Refinement of the mapping discloses increasingly the importance of the geographical factor. Groups of states like the New England-New York Federalist group tend to reappear whenever issues reappear affecting the interests of capital, as in the election of 1828, the Bland Allison Act of 1878, and the Gold Democrats of the Chicago

[3] The studies of political geography which were begun in the author's seminary in American history with a paper by Orin G. Libby, now professor in the University of North Dakota, in 1894, on "The Distribution of the Vote on the Ratification of the Federal Constitution," have been continued since by my students and myself. More recently the Carnegie Institution has undertaken the publication of an atlas of American history in which the method of mapping votes will be used. The writer has not had the advantage of consulting this work as yet, and the present study is in the nature of a reconnaissance paper. For studies of state sectionalism see lists in Turner: Essays in American History, p. 207; A. W. Small: General Sociology, pp. 282–3, note; C. A. Beard: Economic Interpretation of the Constitution, p. 5. See also W. E. Dodd: Fight for the Northwest, *Am. Historical Review*, Vol. XVI, p. 788, map; Boyd: Antecedents of the North Carolina Convention of 1835, *South Atlantic Quarterly*, January and April, 1910; J. A. Morgan: State Aid to Transportation in North Carolina, *N. C. Booklet*, Jan., 1911; F. H. Giddings: Conduct of Political Majorities, *Political Science Quarterly*, Vol. I, p. 116.

Convention of 1896. The areas mapped by congressional districts also show marked persistence and relationship to lines of communication and centers of capital.

In the mapping of presidential elections by county pluralities from 1836 to the present, the most obvious distribution is into northern and southern political zones, with ragged, intermingling edges. But this fails to reveal fundamental differences between the eastern and the western wings of the various parties, held together by an unstable party alliance. Composite maps exhibiting state elections about 1800 and 1830 indicate the importance of this difference between eastern and western areas at different early periods. It is also clearly shown in recent political history.

The northern area, which tended to be first Federalist, then Whig and then Republican, is broken by groups of opposition counties chiefly in interior regions. The strength of the Whig-Republican area is along such lines of communication and industry as the Great Lakes, the Potomac, and the upper Ohio. It is strongest generally along the routes of capital, commerce, industrial energy, and density of population, with frequent exception of the great cities, where class voting modifies the rule. Even in the city, however, bipartisan organizations tend to make party lines conceal a real identity with the geographic distribution above noted.

This Whig-Republican northern zone was deeply influenced by the distribution of the descendants of New England stock (including the later generations of central and western New York), who occupied the shores of the Great Lakes—particularly in western New York, the "triangle" in northwestern Pennsylvania, the Western Reserve in Ohio, and in parts of Michigan—and the prairie regions of southern Wisconsin, northern Illinois, and part of Iowa, Kansas and Nebraska. Here the persistence of feelings aroused by the issues of the Civil War is also noteworthy.

The Democratic areas in the northern zone give distinct evidence of the location of the southern upland settlers who came to the forested area, before the New York-New England settlers. Here factors of social origin coincided with geographical influences proper. These persistent political groups appear in a series of maps of elections in Ohio, Indiana, and Illinois between 1828 and 1908. For example, the counties bounded by the lines of the Western Reserve on Lake Erie normally vote in the same way, year after year. In Indiana the political grouping is in persistent vertical tiers of counties. In Illinois a map of party grouping looks like a map of the original forest and prairie areas, with the glacial lobe extending from Lake Michigan clearly visible.[4] In eastern Wisconsin and in the Illinois counties adjacent to St. Louis, the German area emerges, in the former as a group of Democratic counties in a Republican region, whenever special issues call it forth; and in the latter regularly as a group of Whig or Republican counties in a Democratic area.

In the lower South from 1836 to about 1850 when the slavery issue blurred the old divisions, the Whig and Democratic areas are strikingly reflective of geological formations. By combining the results of the presidential elections of 1836 to 1848 inclusive to show how pluralities were distributed in three or

[4] Compare E. B. Greene: Sectional Forces in the History of Illinois, *Transactions of Illinois Historical Society*, 1903, p. 75; H. H. Barrows: Middle Illinois Valley; A. Shaw: Local Government in Illinois; J. P. Goode: Geography of Illinois.

all of these four elections it appears that the Whig area was practically identical with the chief cotton raising counties, and that the most important Whig counties were in the belt where the negro was nearly or quite the majority of the population. Of the counties within the Black Belt (*i. e.*, where the negroes were an actual majority of the population) the Democrats carried but two in Georgia, three in Alabama, and four in Mississippi in three-fourths of these elections. Outside of the chief cotton counties the Whigs carried few counties in the same states. The Democratic counties in the same states for this period were almost entirely in the regions of inferior soils.

More particularly the Whig counties occupied the best cotton soils of eastern and central Georgia, (the majorities becoming weaker or vanishing in the Pine Hills strip running through the Cotton Belt). They were located in that part of Alabama known as the Inner Lowlands, bounded on the south by the cuesta (especially by the Chunnemugga Ridge), and on the north by the Pine Hills and the Tuscaloosa strata. The Whig belt, resting on this intermediate strip of calcareous black prairie, swings northwestwardly into the closely divided Whig and Democratic counties at the eastern edge of Mississippi. The alluvial belts along some of the rivers and the limestone area of the Tennessee in northern Alabama supplement this central cotton belt, but in northern Alabama the Democratic influence is the stronger. In Mississippi the Whig counties are largely confined to the alluvial zone adjacent to the Mississippi River and adjacent counties. Tennessee's three natural geographical areas find marked reflections in the political map of these four elections, the Whig areas being the cotton counties of the west, adjacent to the Mississippi, the limestone island of middle Tennessee, and the counties in the fertile valleys of eastern Tennessee. The Democratic counties, with rare exceptions, were the less fertile, rocky soils bounding these Whig areas. The geographical influence becomes clearer the farther this analysis is refined in each of these main areas.

These divisions of the Lower South,[5] obliterated in large measure in the era of civil war and reconstruction and in the later solid South under the influence of the negro problem, still tend to reveal their outlines when tested by mapping minorities and by primary elections in which the negro issue is eliminated. This distribution has also its social aspect, inasmuch as when the area was settled, in the bidding for the best cotton lands the wealthier slave holder excluded the non-slaveholding white, whom economic considerations, and in part his tendencies as a pioneer farmer, turned to the up country and the sand barrens. The Whig aristocracy naturally supported the banking policy of its party, inasmuch as property and the credit needed in their cotton planting were basal in their economy. In Kentucky conditions existed comparable to those in Tennessee, and a similar analysis is possible for other parts of the South.

In the Southern Appalachian area similar composite maps for both the Whig and the Republican period from 1836 to 1908 show that the Whig area was strongest on the lines of communication, and in the bottom lands, while the Democrats were strongest in the upper country. The Republican area shows continuous extension along the Southern Appalachians, becoming a wedge thrust down into the south from Pennsylvania. It is made up only in part of former Whig areas, for it tends to include normally the "white"

[5] See also U. B. Phillips: Southern Whigs, in Turner: Essays in American History, pp. 209, 214-215.

counties above the thousand foot contour as well as the lines of communication.

Many minor geographical aspects might be noted, such as the tendency of the area of the Dismal Swamp canal to go with the northern parties; the persistent trough of Federalists and Whigs running to the interior of North Carolina diagonally from the coast; the efforts of the Tennessee River to assert its presence again and again by showing Whig and, later, Republican counties along its whole course.

In recent political struggles between West and East, the relations of Grangers to the prairie, wheat raising areas, and of the Populists to the later wheat and silver producing areas, are significant. The factors of declining prices of crops, mortgaged farms, appreciating gold and declining silver values as the silver mines were exploited, coincide with transportation problems to produce significant reactions between geography and political history; and these factors are significantly emphasized both by the study of the section made up of groups of states and by the closer analysis of counties.[6]

Perhaps the most fundamental generalization is that there are areas influenced or controlled by geological factors wherein capitalistic considerations are strongest, and that such areas tend to be Whig and later Republican. These capitalistic basins and the conduits of communication between them show increasing tendency to gain at the expense of the intermediate regions less favored by geographical advantages.

Such a generalization is subject to exceptions; there is not absolute geographical control; social or psychological considerations sometimes reverse the result. But there is in each state a normal antagonism between certain sections, on whichever side they take their party stand. As a further consideration it is important to repeat that interstate migration has tended to distribute such groups of settlers as those of New England ancestry and those of southern upland ancestry in special geological provinces. Party inertia is as fundamental as any one factor in determining the result.

The problem resembles that of a complex geological area and demands the use of the multiple hypothesis. Where there are so many possible factors for use in interpretation it is possible to select with unconscious prejudice and so reach unscientific conclusions.

But, whatever the difficulties of interpretation, the main thesis that there is a geography of American politics and that the relation between geography and political history becomes clearer the farther the method of investigation is refined, seems established. The facts demand combined investigation by geographer and historian.

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[6] See for example O. G. Libby: Study of the Greenback Movement, *Wisconsin Academy Transactions*, Vol. XII, p. 530; C. O. Ruggles: Economic Basis of the Greenback Movement, *Proceedings of the Mississippi Valley Historical Association*, 1912-1913, p. 143; S. J. Buck: Granger Movement (maps): E. E. Robinson: Recent Manifestations of Sectionalism, *American Journal of Sociology*, Vol. XIX, p. 446.

THE EFFECT OF LEVEES ON THE HEIGHT OF THE RIVER BED

By ROBERT M. BROWN
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The great flood of 1912 on the Mississippi, which inundated nearly 9,000 square miles of the protected basin, raised again the persistent question as to the effects of levees on the elevation of the river bed. The problem is to a great degree so intangible and so many different situations enter into it that a belief in the general elevation of the river bed due to levees is not strange especially in view of the constant necessity of increasing the heights of levees. The Mississippi River Commission were so embarrassed by the widespread use of the arguments against levees based on this false premise during the recent flood that they reopened the discussion in a report[1] and, from the work of the previous Commissions, reiterated the conclusions that there has been no measurable progressive elevation of the bed of the river during the period covered by the investigations.

The persistent belief is based generally on a number of common though incomplete observations:

1. The building up of a flood plain by successive overflows reducing the slope downwards from the natural levees to the back country gives excellent *prima facie* evidence of an upbuilding bed.

This has been used, especially in the case of the Mississippi River, as an argument against levees. It must be made clear at the outset that there is no denial of the fact that a river may build up its bed, and that a river with such a tendency may continue to upbuild its bed after levees have been constructed along its banks. Where leveed rivers aggrade their channels, the levees are not the cause of the action; rather the upbuilding has gone on in spite of the levees. In case of streams where the tendency to aggradation is lacking, levees not only do not permit continued deposition on the river bed but, on the contrary, seem to have a marked effect in improving a river's channel.

A number of investigations by the Mississippi River Commission sustain this point. The Mississippi River was surveyed during the years 1881-1883 and an average of four cross-sections per mile were taken along the river. The resurvey of the river between the years 1894-1896, especially in the section most improved by levees, yielded cross-sections of greater uniformity and capacity than those of the former surveys, and the conclusion was inevitable that the river channel had been improved by the confinement of the waters. A marked characteristic in the change was the consistent lowering of the crests of all bars in the crossings of the river. In 1880, the Mississippi near the mouth of the Atchafalaya River possessed cross-sections of unusual variety. The depth of the river showed no relationship to the spreading of the waters and, in many places where the river was wide, a deeper section was obtained

[1] Report of the Mississippi River Commission for the year ending June 30, 1912. pp. 3715-3717.

than in the contracted portions. In 1904, after levees had been constructed, the river showed unmistakable signs of cutting more regular cross-sections and the general flow of the low water stage was improved. These cross-sections were taken during low water, inasmuch as it was the belief that any silting up of the channel would be registered more convincingly by the gage readings of the low water stages than of the flood stages. Similar records come to us from the Po. During the first quarter of the nineteenth century the mean of the low water readings was 10.4 feet, during the second quarter 10.3 feet, and during the third quarter 10.1 feet. There was then, during seventy-five years, a slight though persistent lowering of the low water level although, as will be shown later, the flood heights had risen steadily. Such records are not compatible with a filling channel. In like manner, a consistent falling of the low water stages of the Rhine has been recorded at Cologne and Emmerich.

The striking feature of the flood of 1897 on the Mississippi River[2] was the greater height of the flood wave in the lower portions of the river than the stage at the upper river stations led the engineers and the riparian proprietors to expect. The proposition was established, furthermore, that this feature was not abnormal, but, on the contrary, such a change in the regimen of the river had taken place that any flood wave passing Red River Landing (765 miles below Cairo) at a high stage may be expected to cause a flood wave at Carrollton (950 miles below Cairo) a foot or more higher than a flood of the same height would have caused fifteen or twenty years ago. The explanation of this change in flood height has been that it resulted from the upbuilding of the river's bed, and, in this particular case, that the bed was filling about and below Carrollton. If such were the case, it is obvious that the effect, in the instance of low flood waves, would be proportionally more noticeable than in the case of the high. Tables of low flood waves show no tendency whatever towards an increase in the height of the low flood wave at Carrollton and the theory of a filling channel must be abandoned in this instance.

The experiment was conducted somewhat as follows: The low floods, which have been recorded since 1872 at Red River Landing and Carrollton, were tabulated. The gage readings, at Red River Landing, fall into three groups, 22.3 feet, 21.4 feet and 19.3 feet approximately. The ratio of the Carrollton stage to the Red River Landing stages, about 19.3 feet, are found to be uniformly less than those of the other two stages and, furthermore, the ratios have increased somewhat during later years. Another reason than the upbuilding of the river bed must be found to account for this situation. It can be shown that the carrying capacity of the river between Red River Landing and Carrollton has been increased. The effect of this would be shown especially during excessive stages of the river, and the greater distribution of the waters directly below the former station would tend to diminish the high water slope while little or no change would be recorded at the latter station because of this change. It was not so much that the flood height had been increased at Carrollton as that it had been lowered at Red River Landing.

2. On portions of the river's course, such as alluvial fans and deltas where the velocity of the river changes suddenly, the situation, while not different from the preceding, offers a greater opportunity for a superficial judgment against the levees. Here again it is not denied that the bed of the river

[2] Report of the Mississippi River Commission for the year ending June 30, 1900. p. 4551.

aggrades, although, in the same breath, the assertion is made that levees not only cause no deposition of sediment but diminish the rate of deposition.

Instances have been cited from many rivers. Some rivers of Japan are reported[3] to have raised their beds. These occur, however, on the alluvial fans where the torrential rains bring great quantities of detritus from the mountain slopes to be deposited on the plains. The quantity of sediment may be so great and the plains so narrow that the entire lowland reach of the river is included in the fan limits. In some instances, where protecting embankments have been built, the river is forty feet above the plain, and the railroads across the lowlands have been placed in tunnels on a level with the surrounding country, underneath the streams, to avoid the inconvenience of floods and the constant demands of shifting the road-bed to the caprices of the upbuilding fan.

It would not be strange if the same condition obtained in the Hoang Ho, for the river brings a great volume of silt from the mountains and plateaus and an upbuilding process on the great river plain is easy to forecast. Many accounts of this river assert that where it is leveed the bed has risen above the surrounding country, but all these statements seem to eminate from a casual observer whose information was not altogether founded on careful investigation. The Mississippi River Commission published[4] in 1890 a letter from China, written by a person of competent authority, in which enough data are included to lead one to believe that no such silting as to raise any part of the bed above the adjacent country has ever taken place.

With the preservation of many ancient gages on the Nile, records covering a thousand years or more show a persistent upbuilding of the Nile Valley from Assuan down to the Mediterranean. The Roda Island gage, near Cairo, records a stage of river necessary for irrigation four feet above what was needed in A. D. 861, which indicates a general rise at the rate of 0.39 foot per century, while similar records below the last cataract give a rise of 0.43 foot per century.[5] This is apt to be the case in all delta building streams. The deposit of sediment at the mouth and the extension of the river's length diminish the slope of the bed; this in turn decreases the velocity of flow and causes deposition of some of the load of the stream until the slope is again restored. The prevention of the spread of the waters and the loss of velocity by the building of jetties has demonstrated the effectiveness of levees to resist this tendency if not to overcome it. Even in the Nile, the change has been so slow as to be practically imperceptible.

It is probable that the great extension of alluvial fan and delta in the case of the Po River has given rise to many conflicting reports from the Italian stream. The tributary streams which flow from the Alps upon the plains north of the Po demand for the transportation of the sediment a steeper slope than the lowland has and deposition takes place. This upbuilding will go on until a more or less permanent slope is attained. The Adige, so often used as an example of a stream whose levees are higher than the surrounding country, is a type of this kind. The bed of this stream would rise if left in its natural state and it can hardly be expected not to do so after the levees have been constructed.

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[3] Harcourt, L. F. Vernon : Rivers and Canals. Vol. I, p. 167.

[4] Report of the Mississippi River Commission for the year ending June 30, 1890. pp. 3093-3098.

[5] Thomas, B. F., and Watt, D. A.: Improvement of Rivers. p. 7.

The confinement of the sediment between the banks of the streams, which is discussed later, causes a more rapid outbuilding of the delta. This increase which is noticeable in the case of the Po will, because of increasing the length of a stream, diminish the slope and cause a deposit between the embankments. Thus, measurements of low water stages near the mouth of the Po will in all likelihood show a slight increase in the average reading in succeeding years. The increase in length of the Mississippi River is about four miles per century. The Mississippi River Commission figures that, with the existing slope, this increase of length would raise the high-water level at New Orleans about seven-tenths of a foot per century or at the average rate of eight-hundredths of an inch per year.

3. The necessity of raising the height of the levees to withstand the floods is used as an argument in favor of the upbuilding bed hypothesis. As the confinement of the waters becomes more and more successful, higher and higher levees are demanded. On the Po, where there has been a decrease of the mean low water during seventy-five years following the introduction of levees, the flood heights have risen steadily.

As the percentage of completed levees increases and the waters, instead of spreading over the broad flood plain are more and more constricted between artificial walls, the high water level will be raised. On the Mississippi River, at the present time, the levees are 81.6 per cent. completed and the uncompleted portions release large volumes of water which detract from the height of the flood crest. Thus, the high water of 1912, which exceeded all previous floods in height at all stations except Vicksburg, had its flood crest lowered by the escape of water through crevasses and over the uncompleted levees. At Greenville, Miss., on April 12, this flood had a stage of 50.75 feet with a previous highest at 49.1 feet during 1903. The Commission estimates that had the water been confined, the 1912 flood at this station would have been 52.8 feet.[6] The provisional grade determined for Greenville after the 1903 flood, to which the Commission has not been able to raise the levees, was 53.1 feet or 2.35 feet above the 1912 flood. The provisional grade is based on the estimated confined height of a flood wave and this estimate places the flood within .3 of a foot of the provisional grade. A new provisional grade based on the 1912 flood, which will be higher than the former one, will set a new height for levees at Greenville. It is absurd to argue that this increasing height of levees arises from deposition along the bed.

The confinement of the waters between levees and the consequent high stages of the river during floods give a greater slope and therefore a greater velocity to the current. The expectation would follow that, instead of depositing sediment, the transporting power of the stream would be increased and scour of the bed would result. It must be remembered that while the water has been constrained, the sediment which formerly was spread over the flood plain is now confined between the levees and the water must carry a larger load, but an increase in the carrying capacity has been effected which permits the waters not only to carry this additional volume of sediment but also to pick up more. A noticeable effect of this appears in the increase in delta building rate. Lombardini has calculated that the annual increase in area of the Po delta, for the period from 1300 to 1600, was 127 acres, but

[6] Report of the Mississippi River Commission for the year ending June 30, 1912. p. 3721.

between 1600 and 1830 the rate was 324 acres. The introduction of levees on deltaic portions of a flood plain, because of the concentration of the flow, results in considerable scour; however, when normality is reached, under the new conditions, the increasing length of the river, which is caused by delta building and which goes on at a more rapid rate because of the confinement of the silt between levees, will result in slight, almost negligible upbuilding of the bed, some part of it being directly traceable to levee construction.

There are other phases of river activity under the present uncompleted state of levee construction which cause temporary deposits on the river bed to the embarrassment of the low water navigation. Crevasses occur during seasons of exceptional high water. The primary evils of such weaknesses in the levees are not pertinent to the discussion but, of secondary importance, are the deposit of sediment over valuable land and the lessening of the stream flow thereby to such an extent that a deposit may also take place in the river bed. The menace of water by levee construction demands a sure knowledge that the levees will withstand the force of the river; but if it does not, while people may escape destruction by heeding the warnings, they cannot escape the loss which results from the heavy deposit of silt dropped by the stream when it spreads beyond the limit of its confines. At the same time, in the bed of the stream there occasionally results a silting due to the loss of carrying power. This condition is analogous to two troublesome factors existing in the Mississippi River, *viz.*, the widening of the stream and the separation of a stream by an island, conditions which do not, however, fall into different categories so far as their results are concerned. In a number of instances on the Mississippi, the river increases in width as it leaves a pool section from half a mile to two miles within a short distance. In other cases the stream is divided by islands. These are the places where dredging has been most necessary and where the experimental wing dikes were constructed in the hope of ameliorating the river channels.

A deposit also takes place on the river bed under a rapid fall in the stage of a river. This deposit is not permanent, but it is moved during the next rising stage of the river; in the meanwhile, however, it is a detriment to low water navigation. If the fall in stage is gradual, the river generally distributes its load and carves out a low water channel. The fall in stage due to crevasses will be prevented to a great degree by an efficient levee system, but the sudden fall in stage due to the distribution of rainfall can be overcome only by withholding enough water in storage to regulate the rate of fall in the stage of a river.

4. In a river free to develop meanders, the tendency to increase the radius of curvature increases the length of the stream and consequently diminishes the slope frequently to such an extent that the lessened velocity is not sufficient to transport the sediment. In such a case there would be an upbuilding of the upper part of the river bed to give a velocity capable of doing the work. This tendency rights itself in two ways. First, the power of the river to erode decreases as the carrying capacity of the water becomes increasingly taxed; or again the river shortens its course by a cut-off and additional power is given to the flow. Under the action of a meandering stream the upbuilding of the river bed may go on for a season. If the river is kept in a stable channel and the tendency to increasing the radius of meanders on one hand and to cause cut-offs on the other is halted, the actual effect of levees, far

from being a detriment to the channel, is beneficial. Furthermore, it may be expected that, when river regulation has become well established, much of the sediment now given to a stream from insecure banks or unclothed slopes will be eliminated and the power of the stream to deepen its channel will be greatly enhanced.

Summary

The observation of the low water gages of rivers proves quite conclusively that there is no persistent upbuilding of the bed due to levees.

On streams or portions of streams where, from the nature of the conditions, aggrading is in operation, the upbuilding of the river bed after levees have been constructed will probably continue.

Deltas increase in area more rapidly in a leveed river and the increase in the length of the stream diminishes the slope and results in a slight deposit on the river bed. The amount is so small as to be imperceptible during a score of years.

The increase in the height of levees can be accounted for by the success of the engineers in confining an increasing percentage of the flood waters.

The elimination of some of the sediment from a stream flowing through its flood plain will minimize the amount of the temporary deposits in beds of rivers and furnish additional power by which the channel may be cleared of bars.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

The Society's Map Exhibit. A set of economic maps was on exhibition in June in the Society's main hall. The exhibits included excellent maps by leading map makers in various countries. Fundamental facts such as natural resources, great trade routes, etc., affecting industry and commerce are illustrated on these maps. The sheets included "Osbahrs Wandkarte zur Wirtschaftsgeographie der Welt" and "Bambergs Wandkarte zur Kultur- und Wirtschaftsgeographie von Nord- und Mittel-Amerika," both published by Chun in Berlin, the economic sheets of Philip's "Comparative Wall Atlases," representative wall maps from the set edited by Vidal de la Blache, published by Colin in Paris, economic maps published by the United States and Canadian governments, the important commercial and industrial map of European Russia issued by the Ministry of Commerce and Industry in St. Petersburg, and sheets selected from the "Documents Cartographiques de Géographie Economique," published by Messrs. Kümmerly & Frey of Berne. These maps give an idea of the wide range of economic topics which can be represented cartographically.

NORTH AMERICA

Studies in the Yosemite Region. Messrs. F. E. Matthes and F. C. Calkins of the U. S. Geological Survey have returned to the Yosemite region, in California, to resume the geological and geographical studies they began last year. These studies are being made, in part, for the immediate purpose of securing data for a popular yet elaborate account of the mode of origin of the Yosemite Valley, to be published by the U. S. Geological Survey at the time of the Panama-Pacific Exposition next year. In part, also, they are to form the ground work for further research into the geological history of the Sierra Nevada.

Mr. Calkins is devoting himself to detailed petrological and structural studies, while Mr. Matthes is investigating the physiographic problems of the region, more especially those bearing on the evolution of the Yosemite Valley.

The Relief Model of the Yosemite Valley. A large relief model of the Yosemite Valley is being constructed at the Office of Public Roads in Washington for the government exhibit at the Panama-Pacific Exposition in 1915. It is twelve feet long, six feet wide and carries relief to a height of 18 inches. The vertical dimension is not exaggerated, and as a consequence all features are shown in their correct proportions. Indeed, so rugged is the topography of the Yosemite Valley, that any increase in the vertical scale would have resulted in a peculiar, distorted appearance of the great cliffs, domes and spires.

The model is being executed, with painstaking exactness, by an expert model maker, and is based upon the detailed topographic map of the Yosemite Valley, prepared in 1905-06 by Mr. F. E. Matthes of the United States Geological Survey. Portions of this map were enlarged photographically to five times the original scale, that is, to a scale of 400 feet to the inch. The contour lines then were used as patterns for the sawing out of thin wooden boards. These boards were built up in layers and the rough form thus obtained was plastered over with a special preparation of great durability that will bear transportation across the continent.

Large numbers of photographs are being used for local details, and a special effort is being made to reproduce with fidelity the peculiar cliff sculpture which is so prominent a factor in the Yosemite landscape. Inasmuch as these sculptural forms are intimately associated with the lines of structure in

the granites in which the valley lies hewn, the model promises to become an unusually fine medium for the study of these relations of form to structure. Students of geology and geography will therefore, in all likelihood, find it an object worthy of a special visit at the San Francisco Exposition. Explanatory legends will be placed on the sides of the case at various places, directing attention to the most interesting features.

In order to heighten the sense of reality, small streams of water, blown to spray by atomizers, will represent the water falls.

New Slips Along the Fault that Produced the California Earthquake of 1906. This great earthquake, as is known, originated in a movement along the San Andreas fault-rift extending over a distance of 290 miles. Since that year, three slight earthquakes have been traced to slips along the same fault. The first on September 12, 1912, occurred near the south end of San Francisco Bay; the second on October 25, 1913, to the northwest of Berkeley; the third, on January 23, 1914, in an intermediate position close to San Bruno. The epicenter of the last earthquake was determined by Mr. E. F. Davis (*Bull. Seis. Soc. Amer.*, Vol. 4, pp. 25-28) by means of Omori's formula for local shocks, from the duration of the preliminary tremors at the Lick, Santa Clara, and Berkeley observatories.

San Francisco Meeting of the American Association for the Advancement of Science. The American Association will hold a meeting in San Francisco and vicinity on the occasion of the Panama-Pacific International Exposition next year. The meeting will begin on Monday, August 2, and terminate on Saturday, August 7. The general sessions and general evening lectures will be delivered in San Francisco. Addresses and papers in the separate divisions of science will be read chiefly at the University of California, Berkeley, with one day's session at Stanford University. The Pacific Committee on scientific programme suggests that as this meeting will be, in a manner, a part of the celebration commemorating the opening of the Pacific to the peoples bordering the Atlantic, it seems fitting that the programme of meetings should relate as far as possible to problems of world interest which pertain especially to the Pacific area.

Live Stock Among our National Forests. *American Forestry* (Vol. 20, 1914, No. 6, pp. 436-437) says the Secretary of Agriculture has authorized grazing permits for the ranges in the 160 national forests during the present year. Nearly 11,000,000 animals can be grazed, including nearly 2,000,000 head of cattle and horses, nearly 9,000,000 herd of sheep and goats and about 65,000 hogs. For several years the carrying capacity of the national forest ranges has been slowly rising. This indicates an improvement in general grazing conditions and better utilization of the forest resources.

Common Minerals and Rocks. The Colorado State Geological Survey has issued Bulletin 6, "Common Minerals and Rocks; Their Occurrences and Uses," by R. D. George, in which the commoner minerals and rocks are described and the means of recognizing them and knowing their uses are supplied. The handbook presents in usable form the important facts regarding the materials of geology with emphasis on the most useful minerals and rocks. While the book especially applies to minerals found in Colorado, it will doubtless have wide usefulness outside of the state.

Notes from our Coal and Oil Fields. According to the *Press Bulletins* of the U. S. Geological Survey, the production of anthracite again broke the record in 1913, exceeding the highest previous output by nearly 1,000,000 tons. The production was 81,718,680 long tons, valued at $195,181,127, compared with 75,322,855 tons, valued at $177,622,626 for 1912. This is an increase of over 6,000,000 tons in quantity and more than $17,500,000 in value. The previous highest record was 80,771,488 long tons, in 1910.

All previous records in the coal production of Ohio were exceeded in 1913

both in quantity and value, although coal-mining operations, like other industries of the state, were seriously interfered with by the unprecedented inundation in March and April of that year. The production increased from the previous maximum output of 34,528,727 short tons in 1912, to 36,200,627 tons in 1913, a gain of 1,671,900 tons. The increased value was $2,864,695, from $37,083,363 to $39,948,058.

With a production last year of 70,000,000 tons of coal, West Virginia takes second rank among our coal-producing states. The increased production was well distributed over the state, there being but three counties out of thirty in which there was a decline in output.

During 1913 the Appalachian oil field, embracing New York, Pennsylvania, West Virginia, southeastern Ohio, and Kentucky, showed a slight decline—1.72 per cent.—in the production of petroleum, falling from 26,338,516 barrels in 1912 to 25,885,640 barrels in 1913, a decrease of 452,876 barrels.

Pueblo Indian Maize and the Climate of the Southwest. One of the most important agricultural problems in the United States is the selection and cultivation of the varieties of cereals which are best adapted to our arid regions. Along these lines of investigation our Department of Agriculture has been doing excellent work in recent years. Mr. G. N. Collins, of the Bureau of Plant Industry, in a recent article on "Pueblo Indian Maize Breeding" (*Journ. of Heredity*, Vol. V, June, 1914), points out that the pioneer work of the Hopis and Navajos along agricultural lines has not been sufficiently appreciated, and that many of the facts which we have ascertained by laborious experiment we might have learned by studying the agricultural practices of our own Indians. From prehistoric times, our southwestern agricultural Indians have raised maize successfully in regions where drought, and especially the absence of spring rains, render impossible the growth of many of the common varieties of Indian corn. The peculiar features of the corn used by these Indians is (1) a greatly elongated mesocotyl which permits deep planting, and (2) the development of a single large radicle which descends rapidly to the moist subsoil and supplies water during the critical seedling stage. Thus the long experience of our Indians with the peculiar climatic environment of their own southwestern "desert" gives us something which we, with all our modern experimental methods, have only discovered slowly and with difficulty.

R. DeC. Ward.

The Meteorological Effects of City Smoke. Professor H. H. Kimball, of the U. S. Weather Bureau, has for some years been studying atmospheric transparency in relation to solar radiation amounts, and other effects. Recently he has devoted himself to the city smoke problem. Some results of his work are given in a contribution entitled "The Meteorological Aspect of the Smoke Problem" (*Monthly Weather Review*, Jan., 1914). City fogs are found to be more persistent than country fogs, chiefly because of their increased density, which is due to the smoke that accumulates in them. Hence there are fewer hours of bright sunshine in city than in country. In London, in the clear part of a winter day, the average limit of visibility does not exceed half a mile. It averages about 1½ miles in Pittsburgh, and this is less than one-tenth of the average visibility in the open country around Pittsburgh. The chemical action of light in smoky cities is 40 per cent. less than in the open country, and over 20 per cent. less on smoky days than on comparatively clear days. Minimum temperatures are higher in city than in country. This is due to city heating, in part, and in part also to the blanketing effect of the smoke, which prevents the escape of heat at night. R. DeC. Ward.

Mr. J. B. Tyrrell's Hudson Bay Exploring Expedition, 1912. The report of this expedition appears in the Twenty Second Report of the Ontario Bureau of Mines, 1913. Mr. Tyrrell was instructed to go to Port Nelson, at the mouth of the Nelson River on Hudson Bay, to select the lands and water front to which Ontario was entitled under the agreement with Manitoba, to survey these lands, and to collect all information possible about the

strip of country within 50 miles of Hudson Bay and extending from the south-eastern bank of the Nelson River to the western boundary of Ontario. Finally, he was to return home through that part of Keewatin that had been added to Ontario as the District of Patricia, and to learn all he could about its resources and possibilities. He was accompanied by Professor Lewis B. Stewart, of the University of Toronto, as surveyor, Mr. W. B. McPherson, as assistant surveyor and also chainman, and by Indian canoemen. The party started down the Nelson from Norway House, at the north end of Lake Winnipeg, in three canoes. Tyrrell reached Hudson Bay by way of the Nelson and Hayes Rivers, and a large-scale survey of the latter stream was made by Professor Stewart below the junction of the Shamattawa River. A frontage of ten miles on the east side of the lower Nelson, to which Professor Stewart's survey was extended, was marked out with posts and mounds. This is the tract that is to belong to Ontario. A suitable crossing of the Hayes River for the plateau railroad was not found until the party arrived at thirty-three miles above its mouth.

The District of Patricia was so little known that Mr. Tyrrell's work there may be regarded as original exploration. He says the district is a fairly distinct physiographic unit, the rocky granitic plateau, about 1,500 feet high, constituting its highest portion. From this plateau, the district slopes gently southward to Lac Seul and numerous lakes fill the depressions in its rocky surface. Northward, the slope is steeper and here the rock basins are filled chiefly with glacial clays and other surface deposits, a number of lakes occupying depressions in them. This northern country is very new geologically and, as there are no well marked valleys, large areas, having almost no drainage, are covered with peat bogs. The timber supply is not large. A considerable number of Crees and Ojibways are scattered over the district making their staple food of fish. The country at present is uninviting, but, with drainage, it seems to offer agricultural possibilities if the climate, of which little is yet known, is suitable. An extended account of the main rivers and an outline of the geology complete the report.

Revelstoke National Park. The Canadian Government has set aside as a National Park an area of ninety-five square miles in the vicinity of Mt. Revelstoke, on the line of the Canadian Pacific Railway, to be known as the Revelstoke National Park.

Glacial Geology in Canada. The study of the glacial history of the Great Lakes has long needed the correlation of beach levels, not only with outlets, but also with the terminal moraines which mark the positions of ice dams. Progress in this direction has slowly been made in the United States and in Canada. However, the director of the Canadian Geological Survey has recently had F. B. Taylor at work on the glacial deposits north of the international boundary (The Moraine Systems of Southwestern Ontario, *Trans. Canadian Institute,* Toronto, 1913, pp. 1-23.) Taylor shows that, during its recession, the ice was molded into pronounced lobes (a) in the Erie-Ontario and (b) in the Lake Huron basin. The shapes of these lobes at various stages are now defined with considerable accuracy. It begins to look as if stagnant ice lobes, and perhaps even isolated ice blocks, did develop in the basins of the Great Lakes. Besides these two main lobes, a third was subsequently developed in the Lake Simcoe region, east of Georgian Bay. Between the three lobes was an oval area, extending over 100 miles northeast and southwest between Collingwood and London, Ontario. This is designated as Ontario Island. It was uncovered a long time before the Erie and Huron lobes to the southwest had separated, perhaps existing a large part of the time before and during the Maumee and initial Lake Whittlesey stages. Although at one time completely ice-covered, it was more like the Driftless Area of Wisconsin and adjacent states in its origin than the nunataks of the borders of the Greenland ice sheet, for it was deglaciated not because of being high, but because the adjacent lake basins caused the lobate ice sheet to shrink from it rather early in the period of their recession.

From this detached, ice-free area of Ontario Island, Taylor assumes that a great sub-glacial stream flowed along a crease between the Erie and Huron lobes. Presumably this had much the same relationships as the present Yahtse River between the Guyot and Agassiz lobes of Malaspina Glacier. That it should have emerged as a clear-water stream, as Taylor assumes, seems doubtful.

The several terminal moraines, shown on a good general map, are described in some detail. The waterlaid moraines were lower, smoother, and weaker than those deposited on the land. Some of the latter rise one hundred feet above the adjacent region and are one to three miles wide. The Oak Ridges moraine, north of Lake Ontario, seems to be an interlobate deposit between the Ontario and Simcoe lobes. One of the greatest needs in the glacial geology of North America is the exploratory mapping of the terminal moraines north and east of this area, where Taylor's excellent work establishes a splendid beginning which some of the Canadian geologists may well follow up.

LAWRENCE MARTIN.

CENTRAL AMERICA AND WEST INDIES

A Scientific Study of Porto Rico. The New York Academy of Sciences has begun a scientific study of the island of Porto Rico along the lines of geology, paleontology, zoology, botany, anthropology, and oceanography. With the assistance of a friend, the academy has voted to expend $1,500 a year for five years on this work, and cooperation with the academy has been assured by the American Museum of Natural History, the New York Botanical Garden and by scientific departments of Columbia University, New York University and other institutions. Furthermore, on account of the representations made by the academy through its representatives, Professors Henry E. Crampton and N. J. Britton, the insular government of Porto Rico has made an appropriation of $5,000 toward the work for the fiscal year beginning July 1, 1914, with the expectation that this appropriation would be repeated on each ensuing four years.

The committee having the work in charge consists of Professors N. L. Britton, James F. Kemp, Franz Boas, C. L. Poor and H. E. Crampton. In furtherance of the project Professor Crampton visited Porto Rico in December and January and Professor Britton and Dr. Lutz in January and February last, and the work is now well under way. Some of the aspects of the work are as follows:

Geology: The geological portion of the scientific study of Porto Rico will be begun this summer by Prof. Charles P. Berkey, of Columbia University, who expects to sail for Porto Rico about the middle of August and to spend a month in reconnaissance work on the island. He will probably be accompanied by some other member of the New York Academy of Sciences. Next winter and in subsequent seasons the details of particular sections will be elaborated by other workers, and the mineral resources will be specially studied. Particular attention will also be directed to the fossiliferous strata.

Zoology: The work was begun in January, when Professor Crampton completed a reconnaissance of the island in order to map out the different ecological regions for further intensive study. Dr. Frank E. Lutz was a member of Professor Britton's party which investigated the islands of Desecheo and Mona, as well as certain areas of the main island. His collections comprise 10,000 insects and notable series of land molluscs and other forms. During the present summer Mr. Roy W. Miner will begin the detailed investigation of the invertebrates of the shores and estuaries, especially those of the harbors of San Juan, Ponce, Mayaguez and Vieques. The coral reefs off the southern and western shores will also receive attention. Mr. John T. Nichols will begin the collection and study of the fishes of the same region, working with Mr. Miner so as to correlate the studies in these two fields. Entomology will be in the hands of Messrs. H. D. Barber, F. B. Watson, and Charles W. Leng. They will study intensively certain characteristic regions mapped out by Professor Crampton and Dr. Lutz. The entomologists of government institutions are cooperating with the survey in this department of activity.

Botany: Several of the members of the scientific staff of the New York Botanical Garden have given much time to Porto Rico, and the results of their labors will be used in further research there by them. Dr. Britton visited the island in January and is going there again in August. The field work will be directed more especially to a study of the fungi and the lichens. Much attention will also be devoted to the reforestation of portions of the island, a subject which vitally concerns the welfare of the colony.

Anthropology: No definite assignments have yet been made, but it is hoped to include this branch in the investigation. Although the ethnology of the present inhabitants will be studied, attention will be more particularly devoted to archæology, especially the examination of anciently inhabited caves and the scientific working over of the kitchen middens.

Oceanography: The oceanographical work can also not be carried out immediately. The plans, however, have already been worked out. They include both physical and biological investigations. The physical investigations comprise a study of the tides and of the ocean currents in the neighborhood of Porto Rico, and the biological, deep sea dredging for animal life. For these two branches of oceanographical work it is hoped to send out a specially equipped vessel.

The specimens which are collected will eventually find lodgment in the American Museum of Natural History, except for the "first set" of duplicates. These will be deposited with the authorities of Porto Rico for the inauguration of an insular museum, and the academy's investigators will take particular pains to insure the good quality and extent of this series (*Science,* June 19, 1914, pp. 896-898).

SOUTH AMERICA

The Argentine Instituto Geográfico Militar. The annual report of this institution contains the account of operations for the year 1913. Its text supplements the data submitted in the first volume, recorded in the *Bulletin* (Vol. 45, 1913, No. 3, p. 199). In accordance with the plan for the extension of geodetic operations throughout the country, field work was carried on in the Provinces of Santa Fé and Corrientes as well as in the Neuquén Territory. The Institute is working in close cooperation with various departments in many of the Argentine provinces in order to accelerate its survey operations.

A working arrangement between the Argentine Hydrographic Office and the Instituto Geográfico Militar provides for the extension of triangulation of the first degree to the coast and the tying of coast surveys undertaken by the Argentine navy to the inland network determined by the Institute staff. Photographic surveying was employed extensively. A map in 1:25,000 of Campo General Belgrano and environs, in the vicinity of Salta, was compiled by this method. The data for seven standard sheets of the topographic map of Argentina on this scale were obtained in this manner. A number of maps on various scales were also published, mainly for military purposes. Progress in the publication of the Argentine sheets of the "Carte internationale du monde au millionième" was delayed pending the settlement of details relating to the execution of the sheets.

Rainfall of Southern South America. In extra-tropical South America there are two great currents of air, one northeasterly, from the tropical Atlantic; the other westerly, from the temperate Pacific. Each of these currents precipitates much moisture as orographic rainfall near the coast, and descends on the lee side of the mountains with a considerably diminished vapor content. The northeast current, even after supplying a heavy rainfall on the Brazilian coast, penetrates the continent as a damp wind, the mountains in its path being low, and its capacity for vapor being large. The westerly current from the Pacific loses most of its moisture on the Chilean slopes of the Andes, and on the western Patagonian highlands. The former current supplies moisture for the rainfall of Uruguay, southern Brazil and northern Argentina, and over the narrow strip of the Andean highlands of northern Chile where snow

and rain occur. The latter current supplies all of Chile with the above exception, and the western half of Patagonia. Between the Atlantic and Pacific rainfall regions there is a semi-arid strip like a long narrow wedge, with the point on the east coast near latitude 48° S., and the base in the extreme north of Chile. The central line crosses the Andes in about latitude 33° S. In this region the rains which do occur affect very limited areas, and are due to purely local disturbances of the atmosphere (H. L. Solyom: "The Rainfall of Southern South America," *Symons' Met. Mag.*, Apr., 1914).

R. DeC. Ward.

AFRICA

Stanley's Chronometer. When Henry M. Stanley completed his exploration of the Congo River he presented the chronometer that helped him to determine positions along his route across the continent to General Strauch, who was later very prominent in the Government of the Independent Congo State. Some time ago, General Strauch presented this interesting souvenir of Stanley's most famous explorations to Mr. A.-J. Wauters, the founder and editor of *Le Mouvement Géographique,* which, for thirty-one years, has supplied the most authoritative and comprehensive record of exploration and progress in the Belgian Congo. Mr. Wauters has long been famous as one of the two or three leading writers on this part of Africa and the many papers from his pen that have appeared in the journal he founded are, to this day, most valuable sources of information relating to this vast and growing colony of Belgium.

ASIA

Dr. F. de Filippi's Asiatic Expedition. The *London Times* prints an extract from a letter written by Dr. De Filippi on March 22 giving some details of the work he proposed to do during the past spring. Writing from Leh, Cashmere, he says he had been there since March 2 arranging for the difficult work of transporting his stores over the Chang La (18,300 ft.) to the Shyok Valley. His party had already done good work that will modify existing ideas as to the construction and geological history of the upper Indus Valley. Many fine photographs had been secured. In April a number of his men were to go to the Rukshu Plains to make gravity observations and he himself intended to proceed to Shyok to arrange for transporting stores to the Dipsang Plains.

AUSTRALASIA AND OCEANIA

Extending British Influence Over the Territory of Papua. The Annual Report of the Government of the Commonwealth of Australia for 1912-1913 on the Territory of Papua, the British possession in New Guinea, says that the scheme for the extension of government influence over the territory has been initiated by the selection of sites on the Fly River and in other regions for government stations. The western part of the territory presents the greatest problem because as yet it is so little known. The object is primarily to put an end to cannibalism, head-hunting and other horrors, the existence of which, it is felt, is a disgrace to an Australian territory. Incidentally it will increase the number of laborers available for employment, but the suppression of crime is the principal object.

EUROPE

Earthquake in Sicily. An earthquake occurred on the southeast flank of Mt. Etna on May 8. It was a strong example of the local shocks often felt within the limits of Etna. For thirteen days slight tremors had given warning and, but for this fact, the loss of life might have been much greater. Over 150

persons, however, were killed and about 500 injured. The villages of Linera, Passapomo, Pennisi and Zerbati were completely ruined and fifteen other villages were half destroyed or seriously damaged.

Mr. C. Davison, writing in *Nature* on this earthquake (May 14, 1914, pp. 272-273), says that the same phenomena seem to characterize all the earthquakes of this district. "The disturbed area is small, the intensity of the shock great in its central portion, and the isoseismal lines extremely elongated in form. In some case the axes of the isoseismal lines are directed towards the central crater; in others (as in the earthquake of 1911) in a perpendicular direction. The small depths of the foci, their situation within the Etnean boundary, and the close connection of many of the earthquakes with eruptions of Etna—all these phenomena point clearly to the volcanic origin of the earthquakes, their immediate cause being probably local slips along radial and peripheral fissures."

Exhausting Russia's Forest Resources. Russia has been commonly reputed to be a country of limitless forests. Last winter, however, the Russian wood famine was so severe that even Moscow suffered from it and some public and charitable institutions were insufficiently heated. The present conditions are narrated for the St. Petersburg *Novoye Vremya* by Mr. Menshikov and a part of his paper has been translated by the *Literary Digest*. He says that, for decades, Russia took no notice of the destruction of the forests. The ruling class, the nobility, sold large parts of their wooded properties rather than sell farm land. Their forests were usually sold for small sums giving the brokers an opportunity to earn 300 to 1,000 per cent. on their capital. In the end the deforestation of the country assumed threatening proportions and the Government finally introduced a forest conservation law. "But . . . the destruction of the forests even now goes on in full blast. The forests which guard the very possibility of man's existence in the north are rapidly disappearing. Firewood is just as vitally necessary to Russia as the sea is to the English and the mountains to Switzerland. One may regret the disappearance of timber, but that can in a large degree be replaced by brick, iron and other construction materials; but fuel in the north, in the form of firewood, cannot be replaced."

Proposed National Oceanographical Institute in Scotland. A movement for the foundation of a Scottish Oceanographical Institute in Edinburgh, to be a memorial to the late Sir John Murray, was inaugurated in the rooms of the Royal Society, of that city, on May 26. The chair was occupied by Prof. James Geikie and among others present were Prof. Sir Edward Schäfer, Dr. W. S. Bruce, Dr. J. G. Bartholomew, Dr. John Horne and others. A resolution that "A permanent foundation of an Oceanographical Institute in the capital of Scotland is highly desirable" was proposed by Professor Geikie and discussed.

Dr. Geikie said that in the Challenger office was housed the finest collection of deep sea deposits in the world. There also were Sir John Murray's extensive library of oceanographical works, probably the best of its kind in Great Britain, and the working machinery in connection with the geological and physical departments of oceanography. Dr. Bruce, on the other hand, had established the Scottish Oceanographical Laboratory at the Surgeons' Hall which contained a large collection of Arctic and Antarctic marine fauna besides collections from the North and South Atlantic Oceans and other seas, as well as what was probably the most complete library of works dealing with the Antarctic. The oceanographical work of Sir John Murray and Dr. Bruce may be said to be complementary, for while the former concentrated more particularly on deep sea deposits and the physics of oceans and lakes, the latter devoted himself more especially to the biological side of oceanographical science. It seemed highly desirable, therefore, that advantage should be taken of the presence of two such well-known laboratories in Edinburgh and that, if possible, they would be conjoined so as to form a permanent oceanographical institute in Scotland. Under Dr. Bruce's charge, this would be a most suitable memorial to his former teacher, Sir John Murray.

A committee was formed for the purpose of considering how such an institution may best be organized, with power to issue an appeal for funds. The members of the Committee include Lord Stair, President of the Royal Scottish Geographical Society, Prof. James Geikie, President of the Royal Society of Edinburgh, J. Y. Buchanan, of the Challenger Expedition, Dr. W. S. Bruce and others. (Condensed from *The Scotsman,* Edinburgh, May 26, 1914.)

POLAR

ANTARCTIC

The Scottish Antarctic Expedition. *Nature* announces (Vol. 93, April 30, 1914, pp 218-219) that the British Government has refused to honor the application for $19,000 to complete the publication of the scientific reports of the Scottish National Antarctic Expedition of 1902-1904. The application was refused though supported by a very influential body of Scottish scientific opinion. The expedition was entirely equipped by money privately raised in Scotland, though mostly due to the generosity of Messrs. J. and A. Coats. This was the expedition led by Dr. W. S. Bruce, the distinguished polar explorer. His discovery of Coats Land is generally recognized as one of the most important additions to our knowledge of the boundaries of the Antarctic Continent. It added a half million square miles to previous estimates of the area of the continent and settled the position of the coast in the one part where there was no clue to its situation. Its collections and oceanographical observations were of the highest importance. Five volumes of its scientific results have been published and three others have been arranged for by a grant previously made by the Government. Four more volumes are required to complete the series. These volumes were to be devoted mainly to description of the biological collections and memoirs which have already been prepared by many distinguished British and foreign naturalists. Much confusion in biological nomenclature may be produced if the publication of these reports be delayed, so that they fail to appear simultaneously with those prepared from the collections of later expeditions. *Nature* expresses the hope that the Government will reconsider its action.

Shackleton in Norway. Sir Ernest Shackleton with nine members of his expedition have been spending some time in Norway to test provisions and motor sledges for his forthcoming Antarctic expedition.

PHYSICAL GEOGRAPHY

Isostasy and the Size and Shape of the Earth. Mr. William Bowie, of the U. S. Coast and Geodetic Survey, read a paper with this title at a meeting of the American Association for the Advancement of Science at Atlanta on Dec. 29, 1913. It is thus summarized in *Science* (June 12, 1914, p. 882):

"The determination of the size and shape of the earth would be a simple matter if its geoid or sea-level surface formed a geometrical figure, but, as it does not, the actual problem is a difficult one. These deviations, it was shown, are due to differences in the vertical distribution of mass in adjacent isostatic regions. When corrections for the effects of topography and isostatic compensation are applied to the astronomically observed positions the deviation of the geoid from the spheroid surface is largely eliminated.

"The shape but not the size of the earth may be determined from the observed values of the force of gravity at stations widely separated in latitude. Here again a correction for topography and isostatic compensation is necessary for the best results. Absolute values of gravity can be obtained only with a long series of observations, and therefore nearly all gravity determinations are made by the relative method. Those of the Coast and Geodetic Survey are based on the absolute value at Potsdam.

"Investigations made by the U. S. Coast and Geodetic Survey during recent

years show that the area of the United States, taken as a whole, is in a state of perfect isostasy, and that areas of limited extent deviate only slightly from that state. The paper will later appear in full."

PHYTOGEOGRAPHY AND ZOOGEOGRAPHY

The Journal of Ecology. This is a new periodical published quarterly by the British Ecological Society and issued from the Cambridge University Press. The first number appeared in March, 1913. The aims of *The Journal* are twofold: "As the organ of the British Ecological Society, it will endeavor to foster and promote in all ways the study of ecology in these Islands. In the second place, it will endeavor to present, by critical reviews and articles, by full notices of recent ecological publications, and by full lists of current ecological literature, a record of and commentary on the progress of ecology throughout the world."

Most of the space is given to reviews of the literature of ecology. An article on Raunkiaer's "Life Forms" and statistical methods is of especial interest and characterizes the first number. Raunkiaer proposes to limit the domain of geographical botany to "that geographical science which endeavors to characterize the earth by its climate in so far as this is manifested by the adaptation of plants to the various seasons." In other words, the plant itself is taken to be the recorder of the biological value of any climate.

The reviews undertaken by this journal are exhaustive and satisfying. An extensive bibliography of recent literature on ecology is also given. The publication gives promise of filling a long-felt need in a very competent manner.

R. W. SHARPE.

ECONOMIC AND COMMERCIAL GEOGRAPHY

The Panama Canal and World Trade. The economic effects of the Panama Canal have already been much discussed. The *Scottish Geographical Magazine* (June, 1914, p. 327) prints a recent note from the London *Times* dealing with a minor point which shows how complex are the conditions that determine the use of a particular route. The Panama Canal route from New Zealand to Liverpool will shorten the distance by about 900 miles, but the exporters of frozen meat have already decided against using the canal. Ships on the Cape Horn route traverse a long stretch of cold water between New Zealand and the cape, and thence strike almost vertically across the equator. During the passage, the cold storage chambers have to be kept cool, and the higher the external temperature and especially the higher the water temperature, the more power must be expended in the refrigerating process. Ships using the Panama route would cross the equator slantwise, and would be steaming through areas of warm water for a much longer period than at present. It is calculated that, in consequence, the machines would require to be driven for a much longer period each day, and that the increased expenditure on coal, when added to the canal dues and the time spent in traversing the canal, would more than counterbalance the saving due to the lesser mileage. The point is of interest as suggesting that the shortest route is not necessarily the most advantageous route.

Fluctuations in the Yield of Great Fisheries. The Permanent International Council for the Exploration of the Sea has recently issued "Fluctuations in the Great Fisheries of Northern Europe Viewed in the Light of Biological Research" by Johan Hjort (*Rapports et Procès-Verbaux*, Vol. 20, 1914, 228 pp., maps, diagrams). The volume is chiefly given to the Norwegian cod and herring fisheries. The introductory paragraph says:

"From the earliest times, a characteristic feature in all branches of the fishing industry has been the fluctuation of the yields from year to year. At the present time, we find the United States complaining of the failure of the mackerel fishery, while in France, a 'sardine crisis' has arisen, the yield of the sardine fishery, which in 1898 amounted to over 50,000,000 kilos, having

sunk in 1899 to below 30,000,000, and in 1902 to less than 9,000,000 kilos. The Norwegian fisheries, which more especially form the subject of the present work, have for hundreds of years experienced alternating periods of rich and poor yield. These periodical fluctuations have as a rule been of some considerable duration, a series of years of profitable fishery succeeding and succeeded by several years of dearth. Thus the term: a good (or bad) fishery period has become an expression of common occurrence.''

PERSONAL

Professor W. M. Davis gave a lecture in the town hall at Suva, Fiji, on April 30 on ''The Origin of the Coral Reefs of Fiji,'' in which he presented the chief results of his seven weeks' visit to those islands as a part of his Shaler Memorial study of coral reefs in the South Pacific. On May 1, he left for New Zealand where he expected to spend the month. His plans were to give June and July to his work in New Caledonia and the New Hebrides, to attend the meeting of the British Association in Australia in August and then go to Tahiti, returning to San Francisco on a steamer due to arrive there on October 29.

Professor N. M. Fenneman, of the University of Cincinnati, is engaged, this summer, in work for the Ohio Geological Survey, chiefly in preparing an educational bulletin on the physiography of a part of southwestern Ohio.

OBITUARY

FERNAND FOUREAU. This distinguished explorer of the Sahara and Governor of the colony of Martinique died in February at the age of sixty-four years. He was one of the most potent influences in securing for France her present prominent position in North and West Africa. Beginning in 1882, he made a series of expeditions into the Sahara, during which he covered with a network of routes the Algerian Sahara, from Insalah in the west, to Ghadames in the east, fixing many positions astronomically, determining altitudes and contributing material for a greatly improved map of the entire region. In 1892 he had reached Timassinin, in 1894, the Tassili on the borders of the Azjer country, and he was incessantly pushing his exploratory enterprises until, in 1898, the French authorities despatched him on the largest expedition that has ever been sent across the Sahara. His baggage camels numbered about 1,000 and he was a year in crossing the desert, having met various difficulties and delays, including some opposition from the Tuaregs. He continued his journey to Lake Chad and the Shari River. By this great journey he opened a way across the Central Sahara to the Sudan and greatly facilitated the extension of French supremacy. Besides publishing a popular account of his last great expedition, ''D'Alger au Congo par le Tchad'' (1901), he presented, in three quarto volumes, the complete scientific results of the journey. This work is one of the most important authorities on the geography of the Central Sudan.

THE REV. STEPHEN D. PEET, PH.D. Dr. Peet died at Northampton, Mass., on May 24. He was the founder, editor and manager of the *American Antiquarian and Oriental Journal,* which he established in 1878. In 1910, Dr. Peet brought to a close the thirty-two years of his association with this publication. The American Geographical Society, in 1892, elected him as a Corresponding Member.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch)

NORTH AMERICA

Early History of Idaho. By W. J. McConnell, who was present and cognizant of the events narrated. 420 pp. The Caxton Printers, Caldwell, Idaho, 1913. $3. 9½ x 6.

The author lived fifty years in Idaho before he wrote this book. He shared in the dangers and hardships of the pioneer days and in the wealth that Idaho has bestowed upon many; and he also served his state as U. S. Senator and Governor. Rich in experiences and in memories, he has written this history of Idaho from the day of the trails, before wagon roads were built, to the admission of the territory into the Union. His story of the fortunes of Idaho, its ups and downs, and its wonderful development is very interesting.

The Canoe and the Saddle, or Klalam and Klickatat. By Theodore Winthrop. To which are now first added his western letters and journals. Edited, with an introduction and notes, by John H. Williams. xxvi and 332 pp. Map, ills. John H. Williams, Tacoma, 1913. $5. 9½ x 6½.

This volume has long been inaccessible, a great loss to admirers of Winthrop, since it is complementary to "John Brent." Winthrop died just when he gave promise of a leading position in American literature. This volume belongs to the period when he was struggling to form a style despite the faults of what then was American literature. To the editor of this volume Puget Sound is a passion and the glimpses of Tacoma are a shrine. Therefore it was to him a labor of love to rescue this work from the oblivion of out-of-print, to annotate its events, to enrich it with pictures. To this he has added Winthrop's journal when on the Pacific Coast and his letters covering the events herein narrated. The region traversed lies across the state of Washington from Port Townsend along the sound and by way of the Naches Pass to the Dalles of the Columbia. The work is one of our original sources for the Chinook Jargon. WILLIAM CHURCHILL.

A Journey to Ohio in 1810. As Recorded in the Journal of Margaret Van Horn Dwight. Edited with an introduction by Max Farrand. Yale Historical Manuscripts. vi and 64 pp. Yale University Press, New Haven, 1913. 8½ x 5½.

The brief Journal of Miss Dwight's journey from New York to Ohio in 1810 is a human document of rare interest, written day by day on the journey, depicting the difficulties of travel, the roughness of the road, the characteristics of the people met, the regions passed through, ending in the joy of reaching the journey's end. It presents, in a striking manner, a graphic picture of travel a century ago. The descriptions are not without traces of humor, the criticisms are particularly individual, and the little volume is a contribution for an hour's reading that is well worth attention.

RICHARD ELWOOD DODGE.

Chicago and the Old Northwest, 1773-1835. A Study of the Evolution of the Northwestern Frontier, together with a History of Fort Dearborn. By Milo Milton Quaife. 480 pp. Ills., index. University of Chicago Press, Chicago, 1913. $4. 9½ x 6½.

Professor Quaife presents here much wealth of cited material. Two facts are conspicuous in his volume. One is that a narrative can seldom be made

quite dull when the war whoop and the gleam of the scalping knife must appear on nearly every page; the other is that he has a quick sympathy with the rude life of the pioneer beyond the edges of civilization and also graces of style wherewith that life may be presented for study. He begins with the problem of man always in search of the easy path, in this case the Chicago portage as determining this particular spot as a tradeway and therefore destined to become a market. The chapter in which he discusses the portage leaves nothing to be desired for the purposes of the geographer. Every memorial of the past has been ransacked for its description and every narrative has been duly weighed as to its credibility, every point sedulously oriented upon the natural features of the two rivers (the Des Plaines and the Illinois) and Mud Lake which set Chicago apart for a metropolis. The remainder of the work,—it ends with the close of the Black Hawk war and the beginning of the modern era of Chicago,—is food for the historian, but the opening chapters are proper subjects of a geographical review. They are excellently done and must stand as the most accurate statement of the situation and causes of the founding of the great city on the lakes. The empire of steam continues Chicago, but here we see that Chicago was marked out by nature for a metropolis by reason of the fact that its Mud Lake afforded the shortest and easiest pathway between Canada and Louisiana, the spot where canoes could be floated and dragged over a few miles of portage between the St. Lawrence and the Mississippi.

The Spanish Archives of New Mexico. By R. E. Twitchell. Vol. I. (In the office of the Surveyor-General, Santa Fé, New Mexico.) xxiii and 525 pp. Map, ills., index. Vol. II (In the Library of Congress, Washington, D. C.). vi and 682 pp. Map, ills., index. The Torch Press, Cedar Rapids, Iowa, 1914.

A valuable list of New Mexican historical documents dating from the year 1621 to the American occupation. The compilation deals with Spanish colonization and the wars between Indians and Spaniards. It is particularly useful in the glimpses it affords of the condition of the Indians during the progress of settlement by Spaniards. Although the work contains no reference to the earliest exploration of the region, titles relating to the period covered are abundant. They are accompanied by concise summaries of the contents of the documents enumerated. Perhaps many of the users of these volumes would prefer having the contents merged into a single chronological list. A letter or symbol might have accompanied each title to designate the repository of the document.

The Old Spanish Missions of California. An historical and descriptive sketch. By Paul Elder. vi and 90 pp. Ills. Paul Elder & Co., San Francisco, 1913. $3.50. 11 x 8½.

The cult of the Franciscan missions is a modern affair in California. In the late '80s no Californian ever gave a thought to the missions except as survivals from a sluggish, preceding civilization which he wrote Mexican and for the most part pronounced Greaser. But with the commercial possibilities of winter tourist traffic California awoke to its missions as a visible asset and has exploited them with great success. We cannot avoid the fact that these structures were erected by inartistic missioners from country rock and clay with the help of ignorant Indians, the sole aim being utilitarian. A pale Melrose moonlight is an essential to viewing them aright. It is such a light that Mr. Elder has succeeded in casting on these more or less crumbling ruins in a series of extremely beautiful photographic prints and a text such as might be expected from perhaps our most successful artist in type. Here we have the missions at their best, a work invaluable for the traveler as he follows the holy path of the Camino Real from San Diego de Alcalá to the Mission Dolores and across the straits to San Francisco Solano. For those who may never make the pilgrimage this handsome volume will offer the best information, albeit nothing can give the distant reader the stimulus of the Californian air which always inspirits and at its worst, say at the end of a three days norther, fairly intoxicates. WILLIAM CHURCHILL.

The Rainfall of California. By A. G. McAdie. Maps. *Univ. of California Public. in Geogr.*, Vol. 1, 1914, No. 4, pp. 127-240. Berkeley. $1. 11 x 7½.

An excellent, clean-cut and readable monograph comes as a fitting contribution from Professor A. G. McAdie at the end of his long term of service as local forecast official of the Weather Bureau at San Francisco. It is a satisfaction to see the emphasis which is here laid upon the conditions and controls of rainfall, instead of the usual method of presenting only the bare facts of amounts and distribution. The author clearly brings out the importance of the control exercised by the permanent centers of action, as well as by the temporary cyclones and anticyclones. In other words, weather is here considered, as well as climate. We note, *e. g.*, charts of sea-level pressures and of the paths of low and high areas in typical "wet" and "dry" winter months. The excess of rainfall in one of the former was approximately 43,000,000 acre feet, and the deficiency in one of the latter was about 33,000,000 acre feet. The economic significance of such conditions is easily appreciated.

We are glad to note the emphasis laid upon topography, and to see photographic reproductions of models of California and of southern California. Such illustrations are a great help to those who are studying the data contained in the report. Special attention is paid to the long-period record for San Francisco; to the variation of rainfall with altitude, and to the snowfall at Summit, for which station there are thirty-five years of observations. The annual amount of snowfall at this place has twice exceeded 775 inches in thirty-five years. There is an interesting discussion of the rate of snow melting, and Fig. 10 shows a photograph of a highly ingenious model, devised by Professor McAdie, which has made possible a comparison of the actual curve of melting for any given season with the mean curve, so that the probable date of the snow's disappearance may be determined. A chart shows the rainfall of California on the basis of thirty years of records, and the monthly distribution of rainfall at selected stations is shown in a diagram. Other illustrations are of the prevailing winds of the Pacific Ocean, and of the ocean currents off the coast of California. Detailed studies of this kind are needed for every state in the Union.

R. DeC. Ward.

Report of the Meteorological Station at Berkeley, Cal., for the Year ending June 30, 1913. By William G. Reed. *Univ. of Cal. Public. in Geogr.*, Vol. 1, 1914, No. 6, pp. 247-306. Map, ills. 60 cents. 10½ x 7.

Mr. Reed's report of the University of California meteorological station is a model one in every respect. Complete, systematic, thoroughly up with the times, it might well be taken as a pattern for similar reports elsewhere. Among the many features which especially deserve attention and commendation are the careful description of the instruments and of their exposure (the latter clearly illustrated by three contour maps and four photographs); the adoption of the new C. G. S. units; the clear tabulation and discussion of the cyclonic control and classification of the rainfalls—a sadly neglected and most essential feature in meteorological and climatic summaries; and, finally, the excellent diagrams.

R. DeC. Ward.

Summaries of Climatological Data by Sections. Vol. 1: Sections 1 to 57, inclusive, embracing the sections west of the Mississippi River. Vol. 2: Sections 58 to 106 inclusive, embracing the sections east of the Mississippi River. Maps, diagrams. *Weather Bur. Bull. W.* Washington, 1912. 11½ x 9½.

Whenever a large amount of statistical data of any sort has been collected, it is a great help to have them summarized in compact and serviceable form. *Bulletin W* contains all the essential climatological data of the United States which are likely to be needed for everyday use by those whose work or interests concern our climate. A very large mass of numerical material is here brought together in a convenient form for ready reference, and

most of the questions concerning climatic conditions in the United States which are daily asked by hundreds of persons here find an answer. The country is divided into 106 "climatological sections." For each section there is a well-considered brief summary of the topographical and the climatic features. Then follows a compact digest of the climatological material which has accumulated during the last half-century, not alone by averages for the whole period, but, for the most important data, by individual months and years as well. Monthly and annual amounts of precipitation, averages and extremes of temperature, frost data, wind velocity and direction, and other information, are presented for each station which has a record long enough to give a fairly accurate picture of the actual climatic conditions. Where data are available, a summary (furnished by the U. S. Geological Survey) gives some of the broader facts regarding the average, maximum and minimum discharges of the principal rivers and streams; the possibilities of water storage, power development, and other details useful to engineers. For each section there is also a full page of diagrams showing the comparative monthly distribution of precipitation at selected stations. These diagrams illustrate very clearly the occurrence of wet and dry seasons, and the local variations in rainfall due to topography and general environment. One of the most useful features is the contoured topographic map of each section, showing the location of the stations and of the principal rivers. These maps supply a need which has long been felt by all those who have had occasion to work on our climatological data. The period covered by the data varies. For most sections the last year in the tables is 1908. In some cases it is later (1909 or 1910). The *Annual Reports of the Chief of the Weather Bureau* will hereafter contain the continuations of these data. It was the intention of the Weather Bureau to give a history of the climate of the United States in as convenient a form for reference as possible. This object has been successfully attained. On the library shelves of every teacher and student of American climatology, and within easy reach of his hand, *Bulletin W* will hereafter be found, next to Professor A. J. Henry's "*Climatology of the United States*" (*Bulletin Q*, 1906).

R. DeC. Ward.

The Natural History of the Toronto Region, Ontario, Canada. Edited by J. H. Faull. 419 pp. Maps, ills., index. Canadian Inst., Toronto, 1913. $2. 7½ x 5.

This book was prepared for the Twelfth Geological Congress, and for all who are interested in the history and natural history of Toronto and vicinity. The work consists of articles contributed by specialists in their respective fields. The last chapter is devoted to a description of the points of scientific interest near Toronto, and how to reach them. There are a number of illustrations and maps; and in the pocket are three larger, unbound maps, for field use, of the county of York and portions of the adjacent counties of Peel, Halton, Simcoe and Ontario; the counties of Lincoln and Welland with portions of Halton, Wentworth and Haldimand; and Toronto and environs.

Wilbur Greeley Burroughs.

New England and New France. Contrasts and Parallels in Colonial History. By James Douglas. x and 560 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1913. $3. 9 x 6.

A native of Quebec, reared on the scene of memorable events, the author became a mining engineer, gained fame in his profession, and acquired in spare moments a ripe knowledge of the history of his native region. This work of sound erudition has grown out of these combined elements. Using the most reliable documents available he has brought to his book originality of touch by his clear comprehension of the economic causes affecting the events of the period he treats. A lifetime of important association with one of the greatest of American industries has been a valuable asset in the preparation of his work. He has spared no pains in research. The high-spirited French colonists are vividly contrasted with the unemotional and matter-of-fact English settlers. Well-chosen quotations from diaries and journals give clear ideas of the colonists' daily life.

Leon Dominian.

CENTRAL AMERICA AND WEST INDIES

Panama. The Creation, Destruction, and Resurrection. By P. Bunau-Varilla. xx and 568 pp. Ills., index. McBride, Nast & Co., New York, 1914. $3.50. 10 x 6½.

The main purpose of this large book seems to be "The Vindication of French Genius" as related to the Panama Canal, and enthusiastic display of the preeminent contributions of the author to this result. He says that the Panama Canal has been realized "by the methods and the plans which the French mind had conceived, though not by the methods it had finally evolved." On page 3 he says:

"My efforts brought about the defeat of the Nicaragua project and its rejection by the nation [the United States] which had conceived it half a century ago and had cherished it ever since.

"My efforts brought about the changes in the political map of Central America.

"My efforts brought about the creation of that new Republic of Panama without which the French enterprise would to-day be dead and forgotten. Thanks to the Republic of Panama it is on the point of completion."

ASIA

The Cochin Tribes and Castes. By L. K. Anantha Krishna Iyer. Vol. 1: xxx and 366 pp. Ills., index. Vol. 2: xxiii and 504 pp. Ills., index. Higginbotham & Co., Madras, 1912. 9½ x 7.

It is probable that interest in this work will center most largely about the first five chapters of Vol. 2, for in that part of the investigation we have such a story of the Nayars as may nowhere else be found. The particular importance of the Nayars in ethnography is that they practice a form of polyandry so different from that in use in Tibet that polyandry makes its first classification under the designation Tibetan and Nair respectively, for we note that until the appearance of this study the tribal name was spelled Nair. For the first time we now have a reasonably clear explanation of the causes out of which has arisen this type of family establishment. We see how suited it is to the social conditions in which it is found and how it works for the improvement of the moral life of the community quite as much as does polygamy in other social conditions. WILLIAM CHURCHILL.

Scinde in the Forties. Being the journal and letters of Col. Keith Young. Edited by Arthur F. Scott. xvi and 201 pp. Map, ills. Constable & Co., London, 1912. 12s. 6d. 9½ x 6.

The volume shows something of the work of reconnaissance and service travel which cleared the way for the great Trigonometrical Survey of India. Colonel Keith Young, then a captain in one of the East India Company's regiments, was sent to Scinde shortly after its capture by Sir Charles Napier. For the better part of ten years he served as Judge Advocate General in the difficult task of attempting to do British justice among a people whose moral sense had developed along quite other lines. His work gave such satisfaction that he was continued in the same employment under Sir Bartle Frere after the retirement of Napier. It is not difficult to discover in his narrative the grievances out of which was to arise in a few years the great mutiny which put an end to the Company rule.

Glimpses of Indian Birds. By Douglas Dewar. xiv and 266 pp. Index. John Lane Co., New York, 1913. $2.50. 9 x 6.

Various birds of India are considered one by one, a rather minute description of their appearance, habits, surroundings, etc., being given. Mr. Dewar's statements are based on his own personal observations, and his findings are original. Indeed, he vehemently attacks many prevalent theories of protective

coloration, the power of animals to think, to reason, to express thought, and kindred subjects. On page 47, he advances a subject for further investigation. He writes: "The correlation or interdependence of various characteristics and organs is a subject full of interest, but one which has hitherto attracted comparatively little attention. Close study of this phenomenon may eventually revolutionize zoological thought."

The book lacks illustrations. If each bird described could, in addition, have been brought before the reader by means of good photographs, the work would have been enhanced in value. As it is it is worthy of attention.

WILBUR GREELEY BURROUGHS.

Java and her Neighbours. A traveller's notes in Java, Celebes, the Moluccas and Sumatra. By A. S. Walcott. xvii and 350 pp. Map, ills., index. G. P. Putnam's Sons, New York, 1914. $2.50. 7½ x 5½.

Introduced by a carefully compiled and well written historical sketch of the Dutch East Indies. The book is intended for the general reader but is not superficial; clearly describes the things best worth attention in the islands visited; entirely subordinates the personality of the author with which too many books of travel are suffused. There are a good index and many excellent illustrations.

Seventeen Years among the Sea Dyaks of Borneo. A record of intimate association with the natives of the Bornean jungles. By E. J. Gomes. xx and 343 pp. Map, ills., index. Seeley & Co., London, 1911. 16s. 9 x 6.

The tribe discussed in this excellent record of mission endeavor is the Iban of Hose and McDougall's classification. Mr. Gomes regards them as an inclusion of an earlier race persisting through a later Malayan wave of settlement. This is open to doubt, in fact the probability is opposed to this conclusion. In the wider study of Indonesia we are led to the belief that in its pigmy Negrito folk we have a survival from one of the foci of human evolution, the discovery of Pithecanthropus by Dubois in this horizon being peculiarly enticing. Postulating information, at present very imperfect, we incline to see in the Punan of the mountains of Borneo a member of this truly autochthonous race. We are in a position to deny the statement as regards the Iban. Recent linguistic research in the Philippines establishes their close agreement with the Subanu, therefore with an early eastern wave of the first Malayan migration over Indonesia coincident with, and operative upon, the expulsion of the Proto-Polynesians, themselves the colony of a migrant swarm. Mr. Gomes is an excellent reporter of manners and customs with which he has had the opportunity and the sympathy to become quite familiar. His volume stands to the work of Hose and McDougall as the expansion of a particular chapter.

WILLIAM CHURCHILL.

Japan's Inheritance. The country, its people, and their destiny. By E. Bruce Mitford. 384 pp. Ills., index. T. Fisher Unwin, London, 1913. 10s. 6d. 9 x 6.

In reference to the political chapters of this work we observe that the author has arrived at the third stage of comprehension of Japan as an Asiatic power and a factor in world power. He blends admiration and condemnation in such wise as to give value to the expression of his opinions as an interpretation of modern Japan. In this particular it is but one of several authoritative books. The true novelty which Mr. Mitford offers is a brilliant study of Japanese landscape as the resultant of tectonic forces. He points out the most beautiful scenes of the Island Empire, he analyzes their beauty with the skill of a painter, he criticises the Sankei which Japanese taste has picked as the three landscape gems, Miyajima, Ama-no-hashidate and Matsushima. With no little skill in the understanding of the constructive force of the plastic dejecta of volcanoes he traces the series of events. So far as is possible he recovers the ancient land surface as basic in the study of the modern

scene. He continues this study through the period of active vulcanism, the disruptive force applied from below upon the ancient anticlines, the deposit of the volcanic overload. The third stage is the aging of the new land form, the weathering and stream erosion. It is rare that we find so much enjoyment in the charm of landscape associated with such skill in the analysis of its structural composition. WILLIAM CHURCHILL.

EUROPE

The Highways and Byways of England. Their History and Romance. By T. W. Wilkinson. xxiii and 270 pp. Ills. Iliffe & Sons, London, 1913 (?) 4s. 6d. 7½ x 5½.

Beginning with the earliest tracks for travel, prior to the Roman Conquest, and continuing to the present day of good roads due to the coming of the automobile, the author shows how the roads of England with their erratic lines, severe gradients, narrowness, and sinuosity, breakneck hills, and dangerous corners were made so, nearly as often from choice as from necessity. But this history of the roads deals with other phases of the subject beside the highway proper. It deals with the part played by roads in history, the account being made more vivid by the narration of specific incidents; the relation of roads to social and commercial progress; and through the lessons taught by the past, we are shown the best methods of improving and utilizing the highways of England for the future. Numerous photographic illustrations give the book an added value. WILBUR GREELEY BURROUGHS.

The Survey Gazetteer of the British Isles, Topographical, Statistical and Commercial. Compiled from the 1911 census and the latest official returns, edited by J. G. Bartholomew. viii and 756 pp. With appendices and atlas. J. Bartholomew & Co., Edinburgh, 1914. 15s. 10½ x 7½.

A new edition so thoroughly revised as to make the book, to a large extent, a new work. It contains some 12,000 additional entries, though by the use of smaller type and condensation of the longer articles the bulk of the volume is reduced. The largest political units as England, Wales, etc., are not treated, but there is great variety of condensed information as to all the smaller units down to the hamlets. The broad lines of geological structure are given for the counties. The appendix contains the etymology of British places names, statistical tables and forty-seven pages of maps of the British Isles, on a scale of 1:633,600 (10 miles to an inch) showing all place names, roads, canals, etc. Political coloring only is used and topography is indicated only by many hundreds of heights in feet.

The Birmingham Country. Its Geology and Physiography. By C. Lapworth. 53 pp. Maps. Cornish Bros., Ltd., Birmingham, 1913. 2s. 6d. 8½ x 5½.

Prepared as a guide for the use of the members of the British Association for the Advancement of Science during their visit to the Birmingham country in 1913. A good description of the geology of the region and of its physiography in the British sense of that word (a general description of the drainage divides, the hills and uplands and the rivers and lowlands without reference to the stages of their genesis). A capital little book to have in hand if a visitor desires to gain more than a superficial impression of this area.

The Place-Names of Nottinghamshire, their Origin and Development. By H. Mutschmann. 179 pp. University Press, Cambridge; G. P. Putnam's Sons, New York, 1913. $2.50. 8½ x 5½.

An interesting study of the origin and development of place names. Thus the name Nottingham seems first to have been Snotingaham (A. D. 868), Anglo-Saxon, meaning the homestead of the family of Snot. In the twelfth

century, under Anglo-Norman influence, the S was dropped and the name became Notingeham; and variations of these Anglo-Saxon and Anglo-Norman spellings during all these centuries are adduced. The field of place-name research presents many pitfalls and dangers and the author of this painstaking study claims nothing more for it than that it may afford instruction to some and "that the theories—often very bold—propounded in the book may draw valuable comments from its critics."

The Place-Names of Oxfordshire, their Origin and Development. By Henry Alexander. With a preface by H. C. Wyld. 251 pp. Clarendon Press, Oxford, 1912. 5s. 8 x 5½.

Enumerates all the examples of popular etymology and notes the influences of Norman French spelling and other points of general philological interest. The place names of about a dozen English counties have now been subjected to similar investigation and the work is in progress in four other counties.

L'Archipel de la Manche. By Camille Vallaux. 256 pp. Collection des Voyages Illustrés. Map, ills. Hachette & Cie, Paris, 1913. Fr. 4. 7½ x 5.

This well-stocked volume on the Channel Islands contains an interesting history of the people, and their customs old and new. Historically the islands belong to England but geographically they are nearly identical in their fauna and flora with the nearby continent and at one time were undoubtedly part of the mainland. The density of population is 380 to the square kilometer, as populous as the industrial and mining districts of Westphalia or Lancashire. The cattle of Jersey and Guernsey, of course, receive due attention. These famous cows are the largest factor in the export trade from the two islands, and the United States takes the greater part of them. Through extensive farming, the people of Guernsey, and Jersey especially, have readjusted themselves to the resources of their islands which were very little known fifty years ago. This little book will be of interest to all who contemplate a trip to these picturesque islands. Much condensed guide book information is given at the end of each chapter and this, with its legendary, geographical and historical phases, makes the book very helpful. It is profusely illustrated and has a small scale map.
A. C. Bartlett.

Les Divisions Régionales de la France. Leçons faites à l'École des Hautes Études Sociales. Par P. Vidal de la Blache, C. Bloch et al. 260 pp. F. Alcan, Paris, 1913. 6 Fr. 8½ x 5½.

Geographical conditions prevailing in France at the time of the revolution are compared with changes due to modern activity. The criteria available for territorial partitioning are shown to resolve themselves into numerous factors among which improvement in transportation methods, growth of urban agglomerations or the development of seaports are of prime importance. The work deserves distinction because it leads to the conception that geographical unity does not depend on mere physiographic delimitation but that it is subject to varied influences. Each qualifying condition may serve for regional demarcation within its own particular sphere. It is only the group, however, which may be considered in singling out a geographical region.
Leon Dominian.

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later

NORTH AMERICA

American Game Birds. By C. A. Reed. 64 pp. Ills., index. C. K. Reed, Worcester, Mass., 1912. 60 cents. 7 x 5.

American Permian Vertebrates. By S. W. Williston. 145 pp. Ills., index. Univ. of Chicago Press, Chicago, Ill. $2.50. 10 x 7.

Das Deutschtum in den Vereinigten Staaten in seiner Bedeutung für die amerikanische Kultur. Von A. B. Faust. 447 pp. Index. —— in seiner geschichtlichen Entwickelung. 504 pp. Index. B. G. Teubner, Leipzig, 1912. 9 x 6½.

The Freight Classification and Traffic Territories of the United States. By E. S. Ketchum and T. D. Fitzgerald. 57 pp. Map. U. S. Commerce Assoc., Chicago, 1913. $1. 9 x 6.

History of the City and County of Schenectady, N. Y. Originally prepared in 1887 for use in the public schools of the city, now revised and brought down to date. 46 pp. [Publisher not given]. Schenectady, N. Y., 1913. 75 cents. 6½ x 5.

The Making of Canada. By A. G. Bradley. viii and 396 pp. Map, index. Constable & Co., London, 1908. 5s. 9 x 6.

SOUTH AMERICA

La República Argentina. Impresiones y comentarios. Por A. Posada. xi and 481 pp. V. Suárez, Madrid, 1912. 9 x 6.

Brasilien: Ein Land der Zukunft. Von H. Schüler. 2nd edit. xii and 479 pp. Map, ills. Deutsche Verlags-Anstalt, Stuttgart, 1912. 9½ x 7. 10 x 7.

Das moderne Brasilien in seiner neuesten wirtschaftlichen Entwicklung. Von E. Dettmann. xii and 486 pp. Map, ills. H. Paetel, Berlin, 1912. 10 x 7.

In Chile, Patagonien und auf Feuerland. Ergebnisse mehrjähriger Reisen und Studien. Von S. Benignus. 369 pp. Maps, ills. D. Reimer (E. Vohsen), Berlin, 1912. 10 x 7.

Aus Chiles Vergangenheit. Plaudereien von A. Wilckens. 108 pp. Imprenta Victoria, Valparaiso, 1913. 8 x 5½.

The Wilds of Patagonia. A narrative of the Swedish expedition to Patagonia, Tierra del Fuego and the Falkland Islands in 1907-1909. By C. Skottsberg. xix and 336 pp. Maps, ills., index. E. Arnold, London, 1911. 9 x 6.

AFRICA

Alone in West Africa. By M. Gaunt. 3d edit. xix and 404 pp. Ills., index. T. Werner Laurie, London. 15s. 9 x 6.

Im Auto quer durch Afrika. Von P. Graetz. 357 pp. Map, ills. Braunbeck & Gutenberg, Berlin, 1910. 9½ x 6½.

L'Agriculture Indigène en Tunisie. Rapport Général de la Commission d'Amélioration de l'Agriculture Indigène, Constituée par le Décret du 13 Mai 1911, sous la Présidence de M. P. Decker-David. 777 pp. Ills., index. Saliba & Fils, Tunis, 1912. 13s. 8d. 10 x 6½.

Chiefs and Cities of Central Africa. Across Lake Chad by way of British, French, and German Territories. By Olive MacLeod. xiv and 322 pp. Map, ills., index. W. Blackwood & Sons, Edinburgh, 1912. 16s. 10 x 6½.

Collection de Monographies Ethnographiques. Publié par Cyr. Van Overbergh. 2: Les Mayombe (État Ind. du Congo). By C. Van Overbergh and E. De Jonghe. 470 pp. 3: Les Basonge (État Ind. du Congo). C. Van Overbergh. 564 pp. Map. 4: Les Mangbetu (Congo Belge). C. Van Overbergh and E. de Jonghe. 594 pp. 6: Les Kuku (Possessions Anglo-Égyptiennes). J. Vanden Plas. 407 pp. 7: Les Abagua (Congo Belge). J. Halkin and E. Viaene. 616 pp. 8: Les Mandja (Congo Français). F. Gaud and C. Van Overbergh. 574 pp. 9: Les Baholoholo (Congo Belge). R. Schmitz. 605 pp. 10: Les Baluba (Congo Belge). Vol. 1. Par R. P. Colle. Maps and ills. A. Dewit, Brussels, 1907-1913. Fr. 10 each. Subscription price Fr. 7.50. 10 x 6½ each.

Eighteen Years in Uganda & East Africa. By A. R. Tucker. New edit. 362 pp. Map, ills., index. E. Arnold, London, 1911. 7s. 6d. 8 x 5½.

Tangier, England's Lost Atlantic Outpost, 1661-84. By E. M. G. Routh. xxviii and 388 pp. Map, ills., index. J. Murray, London, 1912. 12s. 9 x 6.

"Yakusu," the very heart of Africa. Being some account of the Protestant Mission at Stanley Falls, Upper Congo. By H. S. Smith. xviii and 288 pp. Map, ills., index. Marshall Bros., London, no date. 6s. 9 x 6.

South Africa. By J. R. Fisher. Series: Oxford Elementary School Books. Historical Geographies. 189 pp. Maps, ills. H. Frowde, London, no date. 1s. 2d. 7½ x 5.

South Africa To-Day. With an account of modern Rhodesia. By H. H. Fyfe. 298 pp. Ills., index. E. Nash, London, 1911. 10s. 6d. 9 x 6.

The Union of South Africa. With chapters on Rhodesia and the native territories of the High Commission. By W. B. Worsfold. ix and 530 pp. Map, ills., index. Little, Brown & Co., Boston, 1913. $3. 8½ x 6.

ASIA

Journal d'un Voyage en Arabie (1883-84). Par C. Huber. Publié par la Soc. Asiatique et la Soc. de Géogr. xii and 778 pp. Maps. Imp. Nationale, Paris. 1891. 10½ x 7½.

Zigzag Journeys in the Camel Country. Arabia in Picture and Story. By S. M. and A. E. Zwemer. 125 pp. Ills. F. H. Revell Co., New York, 1911. 8 x 5½.

The Monsoon Region of Asia. By E. W. Heaton. Junior Scientific Geography, Book V. 79 pp. Maps, ills. Ralph, Holland & Co., London, 1912. 10d. 7½ x 5.

Armenien: Einst und Jetzt. Reisen und Forschungen von C. F. Lehmann-Haupt. Vol. 1: Vom Kaukasus zum Tigris und nach Tigranokerta. xii and 543 pp. Maps. B. Behr, Berlin, 1910. 9½ x 7½.

Bibliography of the Mineral Wealth and Geology of China. By Chung Yu Wang. 63 pp. J. P. Lippincott Co., Philadelphia, 1912. $1.25. 8 x 5½.

China: Ergebnisse eigener Reisen und darauf gegründeter Studien. Von F. von Richthofen. Vol. 3: Das südliche China. 817 pp. Vol. 5: Enthaltend die abschliessende palæontologische Bearbeitung der Sammlungen F. von Richthofens, etc. By F. Frech. 289 pp. Maps, ills., index. D. Reimer (E. Vohsen), Berlin, 1912. 11 x 9.

Der Chinese in der Öffentlichkeit und der Familie, wie er sich selbst sieht und schildert. In 82 Zeichnungen nach chinesischen Originalen. Erläutert von M. Brandt. 165 pp. D. Reimer (E. Vohsen), Berlin, no date. 9 x 10½.

Tian-Schan. Jagd- und Reisebriefe. Von O. Freiherrn von Dungern-Oberau. xii and 221 pp. Ills., index. D. Reimer (E. Vohsen), Berlin, 1911. 9 x 7½.

Iran and the Iranians. Being an account of the history, religion, constitution, and arts of the Persian people, together with the story of their recent political crisis. By Y. B. Mirza. 265 pp. Ills. Williams & Wilkins Co., Baltimore, 1913. $2. 8½ x 5½.

Through Persia in disguise, with reminiscences of the Indian mutiny. By Col. C. E. Stewart. Edited from his diaries by Basil Stewart. xxiii and 430 pp. Map, ills. G. Routledge & Sons, London, 1911. 9 x 6½.

Syrie, Liban et Palestine. Géographie administrative, statistique, descriptive et raisonnée. Par V. Cuinet. 694 pp. Maps, index. E. Leroux, Paris, 1896. 11 x 7½.

Au pays sacré des anciens Turcs et des Mongols. Par Commandant

de Bouillane de Lacoste. 229 pp. Maps, ills. Émile-Paul, Paris, 1911. 11 x 8.

TURKEY AND THE TURKS. By Z. D. Ferriman. ix and 334 pp. Ills. Mills & Boon, London, 1911. 10s. 6d. 9 x 5½.

LES ÉGLISES DE CONSTANTINOPLE. By J. Ebersolt and A. Thiers. Monuments de l'Art Byzantin, III. vii and 294 pp. Ills. E. Leroux, Paris, 1913. 15 x 12.

ORIENTALISCHE WANDERUNGEN IN TURKESTAN UND IM NORDÖSTLICHEN PERSIEN. Von Hans-Hermann Graf von Schweinitz. x and 147 pp. Maps, ills. D. Reimer (E. Vohsen), Berlin, 1910. 10 x 7½.

DURCH KÖNIG TSCHULALONGKORNS REICH. Eine deutsche Siam-Expedition von Dr. C. C. Hosseus. xii and 219 pp. Map, ills., index. Strecker & Schröder, Stuttgart, 1912. 11½ x 9½.

HISTORISCH OVERZIGHT VAN DE GOUDINDUSTRIE IN SURINAME. Door J. A. Polak. 268 pp. Map, index. M. Nijhoff, The Hague, 1908. 10 x 7.

THE PROGRESS AND ARREST OF ISLAM IN SUMATRA. By G. Simon. xxiv and 328 pp. Marshall Brothers, New York, 1912. 8½ x 5½.

AUSTRALASIA AND OCEANIA

THE MOTHER STATE. The physical features, natural resources, geology, scenery, climate, industries and commerce of New South Wales. By J. M. Taylor. 274 pp. Maps, ills., index. Angus & Robertson, Sydney, 1912. 3s. 6d. 7½ x 5.

DIE FAUNA SÜDWEST-AUSTRALIENS. Ergebnisse der Hamburger südwest-australischen Forschungsreise 1905. Herausgegeben von W. Michaelsen und R. Hartmeyer. Vol. 1: 488 pp. Vol. 2: 493 pp. Vol. 3: 467 pp. Maps, ills. Gustav Fischer, Jena, 1908-10. 11 x 8.

EINE FORSCHUNGSREISE IM BISMARCK-ARCHIPEL. Bearbeitet von Hans Vogel. Mit einer Einführung von G. Thilenius. xvi and 307 pp. Map, ills. L. Friederichsen & Co., Hamburg, 1911. 10 x 8½

FILARIASIS AND ELEPHANTIASIS IN FIJI. Being a report to the London School of Tropical Medicine. By P. H. Bahr. viii and 192 pp. Map, ills. Witherby & Co., London, 1912. 9s. 10½ x 7½.

DIE KAROLINEN. Nach eigenen Reisebeobachtungen, älteren Monographien und den neuesten amtlichen Berichten. Von R. Deeken. 140 pp. Ills. W. Süsserott, Berlin, no date. 8½ x 6.

HISTOIRE DE LA POLYNÉSIE ORIENTALE. Par A. C. E. Caillot. 606 pp. E. Leroux, Paris, 1910. 9½ x 7.

DAS KLIMA VON SAMOA. Von O. Tetens and F. Linke. Ergebnisse der Arbeiten des Samoa-Observatoriums der Kgl. Gesell. der Wiss. zu Göttingen. 114 pp. Maps. *Abhandl. Kgl. Gesell. der Wiss. zu Göttingen,* Math.-Physikal. Klasse, Vol. 7, 1910, No. 4. 10½ x 8½.

EUROPE

ZUR KUNDE DER BALKANHALBINSEL. Reisen und Beobachtungen. Herausgegeben von C. Patsch. 4 vols., 18 numbers. Maps, ills. Inst. für Balkanforschung, Sarajevo, 1911. 9 x 6½.

BRITISH PLANTS, THEIR BIOLOGY AND ECOLOGY. By J. F. Bevis and H. J. Jeffery. xii and 334 pp. Ills., index. A. Rivers, Ltd., London, 1911. 4s. 6d. 8½ x 5½.

THE COUNTIES OF ENGLAND. Their story and antiquities. By P. H. Ditchfield and others. Vol. 1: xxii and 385 pp. Vol. 2: x and 422 pp. Ills., index. G. Allen & Co., London, 1912. 9s. 6d., 2 vols. 9 x 6.

ENGLAND'S RIVIERA. A topographical and archæological description of

Land's End, Cornwall, and adjacent spots of beauty and interest. By J. H. Stone. xii and 492 pp. Ills., index. Kegan Paul, Trench, Trübner & Co., London, 1912. $4. 9 x 6.

REPORT OF A CONFERENCE ON THE TEACHING OF GEOGRAPHY in London Elementary Schools. 80 pp. London County Council, 1911. 9½ x 6.

IRELAND UNDER THE COMMONWEALTH. Being a selection of documents relating to the government of Ireland from 1651 to 1659. Edited, with historical introduction and notes by Robert Dunlop. Vol. 1: clxxvi and 282 pp. Vol. 2: lxxviii and 753 pp. Index. *Public., Univ. of Manchester, Hist. Series, No. 18.* 1913. $8.00. 2 vols. 9 x 6.

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NEW MAPS

Edited by the Assistant Editor

For system of listing maps see p. 74 of this volume

SOUTH AMERICA

Argentina-Chile. Mittel Argentinien und Mittel Chile zwischen 26. und 35. Grad südl. Br. nach den neuesten Quellen bearbeitet, herausgegeben von Prof. Dr. R. Jannasch. Ausgabe 1912. 1:1,000,000. 26° - 35° S.; 72¼° - 55⅚°. 4 colors. In 4 sheets. Engraved by Lith. Anst. v. Leopold Kraatz, Berlin. Price M. 30.

[Valuable map on a relatively large scale based on all of the sources available. Relief is in brown shading, drainage in blue. Railroads, in operation and projected, and roads, main and secondary, are shown. There are six symbols for towns and other settlements; why their explanation is in Portuguese, while the rest of the legend, as is to be expected, is in Spanish, does not appear. The boundaries of many land grants and *colonias* are shown. The choice of the millionth scale is a felicitous one, as, for this economically so important region of South America, the map thus anticipates, in a way, the publication of the relevant sheets of the International Map of the World, some of which, to be sure, have already been issued, in a preliminary edition at least, within the area covered by the map, viz.: South H 19, I 18 and 19, for Chile, and G, H and I 21 for Argentina.]

AFRICA

Sahara. Der Stand der Erforschung der Libyschen Wüste und Tibestis, Anfang 1914. Entworfen von Ewald Banse. 1:7,500,000. 32° - 14° N.;

12½° - 34° E. 5 colors. Accompanies, as Taf. 23, "Der gegenwärtige Stand der Erforschung der Libyschen Wüste und Tibestis: Unterlagen für ein Erforschungsprogramm des letzten grösseren weissen Flecks in Afrika" by E. Banse, *Pettermanns Mitt.*, Vol. 60, I, 1914, March, pp. 137-142, April, pp. 193-196, and May, pp. 261-264.

[Important map embodying all known information with regard to this, the largest area in Africa remaining unexplored. The area never visited by Europeans is left white in contrast to the surrounding known regions in buff. Around the border of this white area are shown, in red, the routes of the travelers who have most nearly encroached upon it. Within the unexplored area are shown all the topographical features known from hearsay, mainly from native report, such as oases, caravan routes, and *wadis*. The map thus shows at a glance what we know about the region and what we do not. The value of such surveys has previously been dwelt upon in reviewing Cana's excellent map showing the progress of exploration of Africa (cf. under "Africa," *Bull.*, Vol. 44, 1912, p. 78). The present map was compiled and the accompanying paper written in preparation for an expedition which the author proposed to carry out to penetrate into the unknown area (see "Record" in June *Bull.*, Vol. 46, 1914, p. 442). This postulate of original exploration—familiarity with previous work in the same field—is unfortunately not always met as satisfactorily by many modern explorers as it has been in this case.]

Sahara. Mission du Transafricain, Janvier-Novembre 1912: Esquisse orographique du Sahara central par le Capitaine Nieger, Chef de Mission, d'après les documents recueillies par la Mission et la carte au 1: 1,000,000e du Sahara en cours d'exécution au Service Géographique de l'Armée. 1:4,000,000. 28½] - 12] N.; 4° W. - 17⅓° E. 5 colors. With inset of western Africa [1:38,000,000], 2 colors, showing location of main map and connecting railroad systems. Accompanies, as Pl. 1, "Résultats scientifiques d'ensemble de la mission du Transafricain" by Capt. Nieger, *La Géogr.*, Vol. 29, 1914, No. 2, pp. 73-113.

[Important general map of the Central Sahara embodying the results of all the recent explorations of the French Army and based more particularly on the eight-sheet map of the Sahara, 1:1,000,000, in course of publication by the Service Géographique de l'Armée. Relief is shown in contours in brown (interval, 100 meters), escarpments being brought out in hachuring in violet. Drainage is in blue, the main *wadis* being shown in stippling; areas subject to inundation in the rainy season (in the transitional area bordering on the Sudan) and *sebkhas* (salt flats) are also differentiated. The mobile dunes of the Sahara are distinguished in buff. In red is shown the route of the projected trans-Saharan railroad (cf. "Record" in May *Bull.* [Vol. 46, 1914], pp. 366-368). The map brings out especially well the inclined plateaus generally terminating in abrupt escarpments on one side which characterize the Central Sahara (contrary to former belief, which conceived of the Sahara as one vast sand desert), such as the Tademait, Tidikelt, Ahnet, Mouydir, Tasili of the Azjers, and the massifs of the Ahaggar, Adrar and Aïr.]

ASIA

Arabia. Northern Arabia: Sketch Map to illustrate the journey of Capt. G. Leachman (Royal Sussex Regt.), 1912. 1:5,000,000. 34¼° - 23° N.; 34° - 51° E. Accompanies "A Journey through Central Arabia" by G. Leachman, *Geogr. Journ.*, Vol. 43, 1914, No. 5, pp. 500-520.

[Contains, with other information as to the adjoining region, the results of Capt. Leachman's important journey from Damascus east and then southeast across the Syrian Desert and the Nefud via Boreida and Riadh to Bahrein Island in the Persian Gulf.]

Burma. Sketch map showing the route followed by Captain B. E. A. Pritchard from Myitkyina to Sadiya, 1911-1912. 1:3,000,000. 28° - 25¼° N.; 95½° - 99° E. With inset, 1:90,000,000, showing location of main map. Accompanies, on p. 525, "A Journey from Myitkyina to Sadiya viâ the N'mai

Hka and Hkamti Long'' by B. E. A. Pritchard, *Geogr. Journ.*, Vol. 43, 1914, No. 5, pp. 521-535.

[Route led through ill-known territory up the eastern branch of the Irrawaddy to near its head and across the divide to the Brahmaputra at the head of the Assam lowland.]

Turkey in Asia. Reise von Môsul nach Aleppo. Originalroutenkarte in drei Blättern aufgenommen von Dr. Walther Hinrichs. [Three sheets:]

Blatt I [in two parts:] Ia. Route Môsul bis Bezâr. 1:300,000. 37°10′-36°17′ N.; 41°42′-43°15′ E. 3 colors. With three insets of places on the route, 1:100,000, approximately: (1) Bawârda. (2) Tell Rumelân. (3) Gebl Batme. Ib. Route von Bezâr nach Ras el Ain. [1:300,000]. 37°26′-36°37′ N.; 40°8′-41°45′ E. 3 colors. With five insets of places on the route, 1:100,000, approximately: (1) Ahlêli Tepe. (2) Serdjechan. (3) Dêr Tschômere. (4) Marbâb. (5) Kinik.

Blatt II. Route von Ras el Ain zum Euphrat. 1:300,000. 37°1′-35°47′ N.; 38°34′-40°9′ E. 3 colors. With inset: Übersicht des Reiseweges von Môsul nach Aleppo. Von Dr. Walther Hinrichs. 1:3,700,000. 40°-34° N.; 34°-44° E. 3 colors.

Blatt III. Route vom Euphrat bis Aleppo. 1:300,000. 37°26′-35°45′ N.; 37°2′-38°35′ E. 3 colors.

Accompany: Blatt I, as Taf. 33, Blatt II and III as Taf. 34 and 35, respectively, ''Eine Karawanenreise von Môsul nach Aleppo vom 9. März bis 25. April 1911'' by W. Hinrichs, *Petermanns Mitt.*, Vol. 60, I, 1914, April, pp. 189-193, and May, pp. 257-259.

[Valuable compass survey of route leading through rarely frequented district along the northern edge of the Mesopotamian plain. Relief in brown, perennial streams in blue, *wadis* in black, author's route in red. Inset on Blatt II shows the extent and location of the individual sheets.]

AUSTRALASIA AND OCEANIA

Australia. (a) Sketch map of the present drainage of the region surrounding the [Federal] Territory. 1:2,000,000. 34⅜°-36½° S.; 148°-150⅝° E.

(b) The ancient river systems, before the period of extensive faulting and folding which led to the capture and reversal in most of the rivers and moved the coast line considerably to the west. Scale and limiting coordinates as on map (a).

(c) Map correlating the chief seismic area of New South Wales with the anomalous river evolution of the region. 1:4,000,000. 33°-37⅝° S.; 147¼°-152° E.

(d) Mean annual rainfall in region around the Federal Territory. From map by the Commonwealth Meteorologist. 1:4,000,000. 34°-37½° S.; 147°-151¼° E.

(e) Departmental plan of the new Commonwealth capital Canberra. 1:60,000. [36°18′ S. and 149°8′ E.]

Accompany respectively as Figs. 10, 11, 12, 13, and 14, on pp. 538, 539, 540, 542 and 548, ''The Evolution of a Capital: A Physiographic Study of the Foundation of Canberra, Australia'' (conclusion) by G. Taylor, *Geogr. Journ.*, Vol. 43, 1914, No. 5, pp. 536-554.

[The remaining figures illustrating Griffith Taylor's paper, the first of which were listed under ''Australia'' in the July *Bull.* (Vol. 46, 1914), p. 557.]

EUROPE

Balkan States. Map of the Balkan States Showing Frontiers in accordance with the Treaties and Agreements of 1913-14. 1:1,750,000. 45°-39° N.; 18¼°-29⅜° E. 8 colors. Accompanies ''Map of the Balkan States in Accordance with Recent Treaties,'' *Geogr. Journ.*, Vol. 43, 1914, No. 5, pp. 559-556.

[Authoritative map based on the maps of the official protocols of the Treaties of Bukharest and Constantinople, which are reproduced in the text,

and on supplementary information furnished by official sources. The critical villages whose positions define the new frontiers are shown in detail. The map does not extend farther south than the Gulfs of Arta and Volo and the island of Mytilene, and so does not show the new boundaries in the archipelago. Relief is in brown shading; railroads, in operation, under construction and projected, are differentiated.]

Denmark. Küstenänderungen im nördlichen Fünen. Entworfen von Prof. Dr. Reimer Hansen. 1:100,000. 55°39.6′ - 55°25.3′ N.; 10°2.0′ - 10°48.7′ E. 3 colors. Accompanies, as Taf. 32, "Küstenänderungen im nördlichen Fünen" by R. Hansen, *Petermanns Mitt.*, Vol. 60, I, 1914, April, p. 204.

[Shows the areas reclaimed from the sea, mainly during the nineteenth century, on the north shore of the island of Fünen.]

France. Plan du cañon du Rhône entre la perte et Génissiat. Dressé par E. A. Martel, 1910-1911. 1:20,000. [46°5′ N. and 5°12′ E.] Oriented N. 25° E. Accompanies, as Pl. 2 "La 'perte' et le cañon du Rhône" by E. A. Martel, *La Géogr.*, Vol. 29, 1914, No. 3, pp. 153-162.

[Detailed map of the well-known limestone gorge of the Rhône below its exit from Lake Geneva. The gorge is indicated by hachures; and altitudes are given to the nearest meter for those determined barometrically by M. Martel and to the nearest centimeter for those taken from the French survey. The contour of 332 meters is shown as representing the level the water would reach if the dam whose construction is under discussion were built at Génissiat, a village at the lower end of the gorge. The main roads and buildings are also shown.]

POLAR

Arctic

Arctic. Die Entdeckungen der Russischen Hydrographischen Expedition unter Führung von Fregatten-Kapitän B. A. Wilkizky im Nördlichen Eismeer im Jahre 1913. Scale of parallels 1:15,000,000. Polar cap approximately within the Arctic Circle, curtailed, however, on the side towards Greenland. 7 colors. Accompanies, as Taf. 31, "Kapt. B. A. Wilkizkis Entdeckung von Zar Nikolaus II.-Land im Nordpolarmeer" by H. Wichmann, *Petermanns Mitt.*, Vol. 60, I, 1914, April, pp. 197-198.

[Valuable map showing in detail the routes of the vessels under Capt. Vilkitsky's command on the recent expedition which led to the discovery of land north of Cape Chelyuskin, Siberia (see "Nicholas II Land" in *Bull.* for February [Vol. 46, 1914], pp. 117-120). The individual westward routes of the *Taimyr* and *Vaigatch* and their route in common eastward are differentiated in colors, and for comparison the routes of Nordenskiöld's *Vega*, Nansen's *Fram* and Baron Toll's *Sarya* and the drift of the *Jeanette* are also shown, in black. Points determined astronomically are especially indicated. Careful editing would have avoided the obsolete representation of the northeastern coast of Victoria Island, which ignores Hansen's survey during Amundsen's Northwest Passage expedition, and might also have availed itself of the information previously published in the same journal (*Petermanns Mitt.*, Vol. 57, II, 1911, p. 71) to the effect that the name of the peninsula between the Kara See and the Gulf of Obi is more properly spelled without an *l* in the first syllable, viz.: Yamal (or in the German transliteration, Jamal) instead of Yalmal.]

Antarctic

South Georgia. (Die "Bay of Isles" in Südgeorgien. Entworfen von Rob. Cushman Murphy.) 1:150,000. 53°59′ - 54°7′ S.; 37°32′ - 37°9′ W. Accompanies, on p. 280, "Die 'Bay of Isles' in Südgeorgien" by R. C. Murphy, *Petermanns Mitt.*, Vol. 60, I, 1914, May, pp. 279-280.

[Reconnaissance survey, made in Dec., 1912, and Jan. and Feb., 1913, with a pocket compass and protractor, of the largest harbor on the northeast coast of South Georgia, an individual survey of which is not included on the standard

chart of the island, British Admiralty Chart No. 3579. In 54°2.5′ S. and 37°12′ W. we note a "Cape Woodrow Wilson."]

WORLD AND LARGER PARTS

Eurasia. Sketch Map to illustrate the papers on the Sea Route to Siberia by Dr. Fridtjof Nansen and Jonas Lied. 1:25,000,000. 90° - 30° N.; 0° - 180°. 1 color. Accompanies "The Sea Route to Siberia" by F. Nansen and J. Lied, *Geogr. Journ.*, Vol. 43, 1914, No. 5, pp. 481-500.

[Shows the route of the *Correct* (see "Record" in February *Bull.* [Vol. 46, 1914], pp. 134-135) from Stettin via Tromsö to the mouth of the Yenisei and back via Tromsö to Grimsby. Settlements are shown in greater detail along the Yenisei than for the rest of the map; the route of the Trans-Siberian railroad is also given.]

Eurasia-Africa. Schema der Bewegungsrichtungen der alpinen Deckengebirge des Mittelmeeres. Entworfen von Dr. L. Kober. 1:15,000,000. 52° -39° N.; 15° W. - 53° E. 4 colors. Accompanies, as Taf. 36, "Die Bewegungsrichtung der alpinen Deckengebirge des Mittelmeers" by L. Kober, *Petermanns Mitt.*, Vol. 60, I, 1914, May, pp. 250-256.

[Based on Suess's work and, more recently, Termier's for the western part of the region, the author divides the young folded mountains of the Mediterranean into two longitudinal belts which lie back-to-back, as it were, and whose folds have been thrust outward in opposite directions. The northern belt he designates the Alpides: its folds are thrust northward over the European foreland; the southern belt is termed the Dinarides: its folds are thrust southward over the foreland of Indo-Africa. To the Alpides belong the Betic Cordillera (Sierra Nevada, etc.), the Balearic Islands, the Pyrenees, Alps, Carpathians, Balkans, and Caucasus. To the Dinarides belong the Alps, the Apennines, the Dinaric Alps, the "Hellenides" (the continuation of the Dinaric Alps in the western half of the Balkan Peninsula) and the Taurus. For part of the distance both belts come into direct contact, as in the "Dinaric scar" of the Alps; elsewhere masses not related in structure intervene, viz., from west to east, the Moroccan meseta, the Tyrrhenian mass (Sardinia and Corsica), the "Pannonian mass" (buried under the Hungarian lowland), the Rhodope, the "Pontic mass" (interior plateau of Asia Minor) and the Armenian. These relations are exhibited on the map.]

Other Maps Received

CANADA

Canada. Geological Survey [of Canada]. Map 26A, Bathurst and Vicinity (Topography), 1:62,500, 1911; 27A, Bathurst and Vicinity (Areal Geology), 1:62,500, 1911; 45A, Tulameen, Yale District (Topography), 1:62,500, 1911; 46A, Tulameen, Yale District (Geology), 1:62,500, 1911; 65A, Coast and Islands between Strait of Georgia and Queen Charlotte Sound (Areal Geology), 1:253,440, 1913; 94A, Taku Arm, Atlin District, 5 mi. to 1 in.; 95A, Broadbock River, Mistassini Territory, 10 mi. to 1 in., 1913; 96A, Wanipigon, Manigotogan and Oiseau Rivers, 1:253,440, 1913; 100A, Bell River, 1:506,880, 1913; 103A, Southfork Coal Area, Old Man River, 2 mi. to 1 in., 1913; 104A, Thompson River Valley below Kamloop Lake, 3 mi. to 1 in., 1913; 105A, Cadwallader Creek Mining Area, Lillooet Mining Division, 2,000 ft. to 1 in., 1913; 107A, Blairmore, 2 mi. to 1 in., 1913; 108A, New Brunswick Carboniferous areas, and positions of certain shale and clay deposits, 20 mi. to 1 in., 1913. Department of Mines, Ottawa.

Maritime Provinces, etc. Map showing the number of chartered banks in New Brunswick, Nova Scotia and Prince Edward Island. 25 mi. to 1 in. Railway Lands Branch, Department of the Interior, Ottawa, 1914.

Telegraph Chart of the Gulf and Lower St. Lawrence and Maritime Provinces. Scale about 27 mi. to 1 in. Department of Marine & Fisheries, Ottawa, 1911. 15 cents.

United States

Kansas. Fort Leavenworth war game map: Leavenworth sheet 12 in. to 1 mi. Made at Army Service Schools. Fort Leavenworth, Kansas, 1909-13.

New York. Rand, McNally & Co.'s Map of Dual Subway System. 1 in. to 1 mi. Rand, McNally & Co., New York, 1914.

Canal Map of the State of New York, to accompany the annual report of the State Engineer and Surveyor. State Engineer and Surveyor, [Albany], 1911.

Rhode Island. Map showing railroads and railways of the State of Rhode Island. Scale about 1.75 mi. to 1 in. Public Utilities Commission of Rhode Island, [Providence], 1909.

United States. Maps of United States Lighthouse Districts. (a) United States Lighthouse establishment, outline map showing districts and a few important lights. 200 miles to 1 inch. U. S. Lighthouse Board, Washington, 1909.

(b) Districts: 1st, from St. Croix River, Me., to Hampton Harbor, N. H., (inclusive), 12 mi. to 1 in.; 2nd, from Hampton Harbor, N. H., to Elisha Ledge, R. I., (not inclusive), 8 mi. to 1 in.; 3rd, from Elisha Ledge, R. I., to Shrewsbury Rocks, N. J., (inclusive), 12 mi. to 1 in.; Part of 3rd, [Lake Champlain]; 4th, from Shrewsbury Rocks, N. J. (not inclusive), to Metomkin Inlet, Va. (inclusive), 10 mi. to 1 in.; 5th, from Metomkin Inlet, Va. (not inclusive) to New River Inlet, N. C. (inclusive), 20 mi. to 1 in.; 6th, from New River Inlet, N. C. (not inclusive) to Jupiter Inlet Light-Station, Fla. (inclusive), 32 mi. to 1 in.; 7th, from Jupiter Inlet Light-Station, Fla. (not inclusive) to and including Perdido Entrance, Fla., 35 mi. to 1 in.; 8th, from Perdido Entrance (not inclusive) to the southern boundary of Texas, 35 mi. to 1 in.; 9th, [Lake Michigan], 15 mi. to 1 in.; 10th, from mouth of the St. Regis River, St. Lawrence River, to mouth of the River Rouge, Detroit River, 12 mi. to 1 in.; 11th, from mouth of the River Rouge, Detroit River, to westerly end of Lake Superior, 28 mi. to 1 in.; 12th, California from Mexican boundary to Oregon boundary, 38 mi. to 1 in.; 13th, Washington and Oregon, 28 mi. to 1 in.; 12th Subdistrict [Hawaiian Is., 25 mi. to 1 in.; Samoan Is., 20 mi. to 1 in., and Melanesia, 200 mi. to 1 in]; 14th, Tennessee and Ohio Rivers and part of Mississippi River, 20 mi. to 1 in.; 3rd Subdistrict, West Indies between the Mona and Virgin Passages, comprising Porto Rico and Dependencies, 22 mi. to 1 in.; part of 13th, [Alaska], 100 mi. to 1 in.; 15th, Mississippi River above Cairo, Missouri River to Kansas City, and Illinois River from mouth 224 miles, 18 mi. to 1 in.; 16th, [Mississippi River from New Orleans to Cairo], 18 mi. to 1 in. [With insets of important bays and harbors on each sheet]. U. S. Lighthouse Board, Washington, 1909.

SOUTH AMERICA

Argentina. Central Argentine Railway: Map of the Argentine Railways, 1913. 1:200,000. Insets: Tucuman; Cordoba; San Francisco; Santa Fé; Buenos Aires; Rosario. [Published by Central Argentine Railway, Buenos Aires]. [Gift from Mr. Ronald Falconer].

Plano de los ferrocarriles de la República Argentina, indicando la ubicación de las colonias fundadas hasta la fecha por la antigua Empresa ''Colonización Stroeder.'' 1:2,500,000. Oficina Cartográfica de Pablo Ludwig, Buenos Aires.

Peru. Mapa general del Perú, trazado, correjido y augmentado segun mapas oficiales. 1:3,000,000. Editado por la Litografia y Tipografia Carlos Fabbri, Lima, 1909.

El Perú: mapa popular, trazado por la Sociedad Geográfica de Lima. Dibujado por Camilo Vallejos. 1:3,000,000. Carlos Fabbri, Lima, [1913].

AFRICA

Nigeria. Africa, 1:250,000: Southern Nigeria, Sheet North C 31/V.IV. Lechilaku. Director of Surveys, Southern Nigeria, [Salisbury], 1913.

Rhodesia. North-east Rhodesia. 1:2,000,000. Topographical Section, General Staff, War Office, London, 1905. Price 2/–.

EUROPE

Austria. Geologische Karte der im Reichsrate vertretenen Königreiche und Länder der Österreichisch-Ungarischen Monarchie. 1:75,000. Zwölfte Lieferung: Blatt Iglau (K. 7.50); Wels-Kremsmünster (K. 4.50); Enns-Steyr (K. 4.50); Kirchdorf (K. 7.50). Verlag der k. k. Geologischen Reichsanstalt, Wien, 1913.

Geologische Uebersichtskarte von Böhmen, Mähren u. Schlesien, entworfen von Doc. Dr. K. Absolon und Zd. Jaroš. 1:300,000. Verlagsbuchhandlung R. Promberger, Olmütz, 1907.

Spezial-Karte der Gross-Glockner-Gruppe. 1:50,000. Bearbeitet nach den Reambulirungs-Aufnahmen des k. u. k. militär-geographischen Institutes, [Wien], 1913.

Umgebungskarte von Marienbad. 1:25,000. Buchhandlung Franz Gschihay, Marienbad, [1913].

British Isles. Liverpool Bay, surveyed by the Marine Surveyor of the Mersey Docks & Harbour Board. 5 mi. to 1 in. Mersey Docks & Harbour Board, Liverpool, 1913. Price 2/–.

Ordnance Survey of Ireland (3rd edition), Killarney District. 1:63,360. Ordnance Survey, Southampton, 1913.

Ireland [in 4 sheets]. 1:486,830. Edward Stanford, London.

France. Onésime Reclus: Atlas de la Plus Grande France. Neuvième, dixième, onzième et treizième livraisons. Attinger Frères, Paris, 1914.

Germany. Geologische Karte von Preussen und benachbarten Bundesstaaten. 1:25,000. Sheets: Lüneburg, 1912; Lauenburg, 1904. Königlich Preussische Geologische Landesanstalt, Berlin.

Geologisch-agronomisch Karte von Flensburg und Umgebung, aufgenommen von Prof. M. König und Dr. W. Wolff. 1:25,000. Königlich Geologische Landesanstalt, Berlin, 1908.

Italy. Carta politico-ammistrativa della Patria del Friuli al cadere della Repubblica Veneta. Saggio di Gian Lodovico Bertolini e Umberto Rinaldi. 1:200,000. Istituto d'Arti Grafiche, Bergamo, 1913.

Carta d'Italia del Touring Club Italiano, in 58 fogli. 1:250,000. Istituto Geografico de Agostini, Novara, [1914]. Price L. 1 ea. sheet.

[Admirable map. The engraving of relief, in brown hachures is equal to the highest standards of German cartography.]

Foci del Tavere e litorale adiacente: plano dimostrativo delle variazioni delle costa avvenute nelle diverse epoche. 1:30,000. Istituto Idrografico, 1913.

The Netherlands. Ten Brink's Groote Kaart van de Provincie Utrecht met het Gooiland en Amsterdam. 1:80,000. H. ten Brink, Meppel, [1913].

Ten Brink's Groote Kaart van de Provincie Gelderland, door J. de Regt. 1:140,000. H. ten Brink, Meppel, 1908-09. F. 1.

Sweden–Russia, etc. Philips' Timber and Mercantile Map of the Baltic. Equatorial scale, 1:2,000,000. With insets: The North Sea, equat. scale, 1:5,000,000; North European Ports, including the White Sea, equat. scale, 1:1,000,000. Geo. Philip & Son, London, [1913].

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BULLETIN

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VOL. XLVI 1914 No. 9

THE HOME STUDY OF CORAL REEFS*

By W. M. DAVIS
Harvard University

3. *Barrier Reefs and Atolls on Still-standing Islands.*[8] The shore of an oceanic island, newly formed by volcanic eruption, and then suffering no change of level as a result of subsidence or of elevation of the ocean bed from which it was built up, may be colonized by floating coral larvæ, and, as result, a fringing reef will be formed around it. The reef may then grow outward on its own talus, while its inner part is dissolved away, leaving a lagoon; thus the fringing reef will be converted into a barrier reef. In the meantime the central volcanic island will be worn down lower and lower; and eventually, after a long continued enlargement of the reef by outward growth and of the lagoon by solution, the central island may disappear, and the barrier reef will then become an atoll.

This theory, like the preceding one, is based upon the improbable postulate of an unchanging ocean bed and still-standing islands. It then proceeds by easily imagined steps, but its consequences are incompletely stated. It is eminently possible that a reef may grow outward on its own talus; but if so, the entire mass of the reef must have a steep-dipping talus structure, probably disordered by slips and slides, but nowhere showing horizontal stratification. The detailed outline of the outgrowing reef will be more or less affected by winds and currents, as in the case of atolls, above mentioned; but the larger outlines will be chiefly determined by the form of the

* Continued from the August *Bulletin*, pp. 561-577.

[8] Sir J. Murray: On the Structure and Origin of Coral Reefs and Islands, *Proc. Roy. Soc., Edinb.*, Vol. 9, 1880, pp. 505-518.

island that the reef encloses. The submarine part of the reef should rest upon a non-eroded volcanic slope. It is theoretically possible that solution may dissolve away the inner border of a reef, where coral growth is weak or absent, and thus enlarge a lagoon; but it has already been stated that the deposits of the lagoon bottom do not favor the supposition that its entire area results from the removal of pre-existent reef-limestone by dissolving it out.

A central volcanic island may be conceived as standing still while a surrounding reef grows outward; but if so, many members of its flora and fauna must be only accidentally related to those of neighboring islands, as a result of haphazard transportation back and forth in recent as well as in earlier times; they will not show those systematic relationships which are said to exist in certain island groups, and which are only explicable by slow evolutionary variation from common ancient ancestors without modern intermixture: this important principle will be further considered in connection with the sixth theory here listed. Again, islands outside of the coral seas, and hence not protected by reefs, ought to have platforms cut around their shores by the waves, as is more fully considered under the next theory.

Furthermore, if the central island of a reef stands still, any initial embayments of the shore line, due to irregularity of volcanic growth, will soon be filled with gravel, sand and mud; and deltas will be thereafter built forward on the initial reef or in the lagoon at a rate proportional to their drainage area. It is here important to note that the deltas will not be at the head of bays, for bays, apart from those due to initial inequality of volcanic construction or engulfment, do not exist on volcanic islands that have not subsided. The deltas will form salients outside of the simple perimeter of the initial volcanic cone. As they are built farther forward, they will widen laterally, and eventually unite in a confluent alluvial lowland around the island, wider in front of the valleys, narrower in front of the ridges and spurs; and at the same time the central island will be slowly worn down to fainter and fainter relief, and its deltas may ultimately be removed by the lagoon waters, and then an atoll would result; but if all of the many existing atolls have been thus formed, many examples of barrier reefs should be found in which the central islands show subdued forms and low relief in the slowly changing, long lasting, penultimate stages of almost complete degradation; and in the completed atolls, volcanic rocks should be found by boring through a thin cover of calcareous muds in the center of the lagoon.

These consequences are very imperfectly matched by the facts. Tahiti is instanced as possessing an alluvial lowland around the base of its dissected volcanic mass, and thus as confirming this theory. Darwin recognized this many years ago, and interpreted it as indicating a pause in subsidence;[9] but he recognized also that such alluvial lowlands were not of common occurrence around the central islands of barrier reefs, most of which have embayed shore lines; hence, after considering the possibility of outward reef-growth around a still-standing central island, he properly discarded it as of rare occurrence. No good examples of vanishing central islands, worn down to low relief as demanded in the penultimate stage of this theory, are known, although in view of the common occurrence of atolls they should be abundant; hence it is improbable that actual atolls represent the ultimate stage. The borings in the lagoon of Funafuti, to depths of over a hundred feet beneath its floor, did not discover volcanic rock; hence this atoll cannot be built around a worn-down, still-standing volcanic island. In this connection we may quote the opinion of Hedley and Taylor, regarding the Great Barrier Reef, northeast of Australia, to the effect that if the reef had been built outward during a still-stand of the mainland, the mainland border should now be worn down to a peneplain and fronted with deltas; but, as a matter of fact, good-sized hills still enclose the valleys, which mouth in embayments, the outlines of which have as yet hardly been softened by the deposit of sediment along their shores, though there are alluvial flats at the same bayheads.[10]

The structure of uplifted reefs is so imperfectly described—perhaps because the observers of these significant structures had not consciously deduced the contrasted consequences of rival theories—that it cannot be safely used in the present discussion; but as far as I have read, there is no well attested example of an uplifted reef which consists wholly of outward-slanting talus layers. Some uplifted reefs seem to have been built on eroded surfaces, and this implies subsidence before or during the growth of the reef, as will be further considered in a later section.

This theory is therefore, to say the least, not proved to be a counterpart of nature, unless in local, special and exceptional cases. It is ingeniously contrived; but its leading postulate of a still-standing central island is not tested by an examination of the flora

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9 Coral Reefs, p. 128.

10 Coral Reefs of the Great Barrier, Queensland . . . *Proc. Austr. Assoc. Adv. Sci.*, Vol. XI, pp. 907, 397–413; see pp. 410–411.

and fauna or of the shore lines of the central islands enclosed by barrier reefs; if it were thus tested it would, if we may accept the conclusions of certain zoologists, be in nearly all cases contradicted. One of the essential consequences of the theory—the occurrence of alluvial lowlands around the inner border of the lagoon—is of decidedly exceptional occurrence; another—the rough bottom of the lagoon, as a result of solution—does not correspond to the facts; others, as to internal structure, are not now confirmable, because the corresponding facts are invisible in actual barrier reefs, and imperfectly determined in uplifted reefs. The theory would be improved, if it were amended by replacing the postulate of a still-standing island by a slowly subsiding island, but that would transform it into the theory here numbered 6. Judgment must therefore be pronounced against it, except in special cases where alluvial lowlands occur within the lagoon; and even in these cases, the still-stand thus indicated may be only a pause in a prolonged subsidence.

4. *Veneering Reefs on Sea-cut Platforms.*[11] A still-standing island, attacked by the sea and unprotected by a growing reef, will have a platform cut at a moderate depth all around its border; a reef may then be built on the outer border of the platform, enclosing a lagoon; thus a barrier reef will be formed without subsidence or outward growth. This theory is based on the tacit postulate that corals shall not establish themselves until the platform has gained a considerable width; this appears unreasonable, inasmuch as newly established, discontinuous fringing reefs have been observed on the uncliffed shores of a young, slightly dissected volcanic cone in the island of Mehetia, east of Tahiti.[12] Several essential consequences of this hypothesis, not stated, however, by its advocates, are that the island should rise in steep cliffs from the inner border of the sea-cut platform, as was pointed out by Darwin in 1842; that islands of this form should occur outside of the coral seas, and the older the island, the broader its platform; that, after a barrier reef is established on the outer border of the platform, enclosing a shallow lagoon, a talus should accumulate at the base of the cliffs and deltas should be built forth from valley mouths; and that uplifted reefs of this kind should have small thickness on the outer border of a nearly horizontal bench of volcanic rock which contours around the fading cliffs of the central mass. The floræ and faunæ of neighbor-

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11 Journal of Voyages and Travels. By the Rev. Daniel Tyerman and George Bennet. Deputed from the London Missionary Society to visit their various stations in the South Sea Islands, China, India, etc., between 1821 and 1829. 3 vols. Vol. I, p. 215. Crocker & Brewster Boston, 1832. (This reference is taken from Darwin's "Coral Reefs.")

12 A. Agassiz, *Mem. Mus. Comp. Zool.*, XXVIII, 1903, p. 140.

ing islands should be accidentally related, as stated under the previous theories; but this requirement is contradicted by the facts, as far as they have been closely studied. Furthermore, no cliffed volcanic islands, surrounded by a shallow submarine platform not yet colonized by corals, and no barrier reefs around a lagoon with a cliffed central island are known in the coral-reef regions: hence this theory has seldom found favor.

The postulate of a still-standing central island has already been shown to be improbable; no independent evidence is presented to show that the postulate is reasonably acceptable in the islands to which the theory has been applied. The action of the sea in cutting a platform around an undefended volcanic island is not to be denied, but when the features appropriate to such action—a central island with a sea-cliffed margin—are looked for, features of quite another kind are found. It is important to recognize that the cliffs, which must necessarily rise from the inner border of a wave-cut platform on a volcanic island that has not suffered subsidence, will not truncate promontories between bays, for, as already stated, bays, apart from those due to the initial inequalities of the volcanic cone, do not occur on volcanic islands that have not subsided. The cliffs at the inner border of a sea-cut platform will usually have a somewhat simpler outline than the initial circle or oval of the volcanic cone; they will be less developed on beds of resistant lavas, and more developed on beds of loose ashes. If the volcano is young and the platform is narrow, the cliffs will be relatively immature, ragged and low, and will be interrupted only by narrow, young gorges; if the volcano is longer extinct and the platform is wide, the cliffs will be high because they will have been cut far back into the conical island; and they will be interrupted by broadly opened valleys, because the time required for cutting a wide platform will be long enough for the mature dissection of the cone. These are systematic relations which deserve conscious consideration in the study of central islands within barrier reefs; they illustrate a modern phase of rational geography, in which the systematic evolution of land forms is fully recognized, just as the biotic relations of neighboring islands, briefly mentioned above and more fully treated under the sixth theory of this list, illustrate a modern phase of rational biology, in which the systematic evolution of organic forms is fully recognized. There was a time, not long ago, when land forms, like organic forms, were thought to be outside of an investigator's responsibility, because they were taken to have been made about as we now see them. The general adoption of an evolutionary philos-

ophy has changed all that, and land forms are now seen to be the result of inorganic evolution, and hence to be fit subjects for intelligent study, just as plant and animal forms are seen to be the result of organic evolution.

The tacit postulate of the delayed colonization of a volcanic island by corals is inherently improbable, and no evidence is adduced to show that it may be accepted. The small thickness of the veneering reefs on the outer border of a nearly level sea-cut platform is not proved by borings, or by the features of uplifted reefs. The theory can have only a very restricted application, if it holds true at all. Adverse judgment need not be suspended.

5. *Veneering Atolls on Sea-cut Platforms.*[13] It is here assumed that a still-standing island is completely truncated and that a reef then built around the border of the truncating platform forms an atoll. As in the preceding theory, a tacit postulate is here made that corals shall not establish themselves on the border of the platform until the sea has completed its work of truncation, and so long a postponement of their arrival is certainly unreasonable. If the numerous atolls of the Pacific had been formed in this way, borings should show volcanic rocks at small depth beneath the whole of the lagoon; some nearly and some completely truncated volcanic islands should occur in the temperate oceans, outside of the coral zone; and, above all, some examples of penultimate truncation should occur in the coral seas, showing cliffed island remnants rising above a broad and shallow platform without reefs. None of these consequences are, as far as I have been able to learn, confirmed by the facts. It is true that the charts of our Hydrographic Office show some singular, residual, spine-like rocks, much higher than they are broad, rising from the sea south of Japan; one, known as Lot's Wife (29°45′ N., 140°20′ E.), is 466 feet high, with no bottom at twenty fathoms close around it; another, Smith Island (31°30′ N., 140°0′ E.), is 421 feet high, with depths over 100 and 200 fathoms near by it. Both these rocks have overhanging profiles on one side; they seem to resemble the famous volcanic spine of Montagne Pelée, and may have lost the weaker, fragmental material with which their base was originally enclosed; but they do not appear to correspond to a late stage in the truncation of a large island, for they are not surrounded by a shallow platform. The flat platforms, in the Pacific, without coral reefs rising to the surface, which suggested this theory, might be as well explained as former atolls, too rapidly depressed to be built up, as Darwin long ago suggested for the Chagos Bank. This theory

13 Rear Admiral W. J. L. Wharton: . . . *Nature*, Vol. LV, 1897, pp. 390-393.

has therefore found little favor. Comments similar to those made on the preceding theory apply here with equal force.

6. *Reefs Built on Subsiding Islands.*[14] This theory postulates in its simplest form that the islands "on which the reefs first became attached, slowly and successively sank beneath the sea, whilst the reefs continued to grow upward"; thus a fringing reef will be transformed into a barrier reef enclosing a lagoon around a diminished island, and into an atoll, after the island disappears.

Let it be here noted that the term coral reef, as used by Darwin and indeed by most other writers, has two meanings:—one is the visible belt of corals with a small thickness of coral limestone beneath; the other is the whole mass which, it is inferred, is added to a volcanic island to produce a fringing or barrier reef, and which therefore includes the interior lagoon deposits and the exterior talus deposits, along with the coral limestone that has been formed, according to the present theory, during the upgrowth of the reef proper. It is important to recognize this double meaning, because some recent studies suggest the separation of the reef in its smaller meaning from the larger understructure, and propose for the whole of the latter, the greater part of which is presumably not composed of coral rock but of lagoon and talus deposits, the name platform. It is, however, not yet shown that coral rock does not extend downward about as deep as the outer part of the platform, or that the reef and the platform have not been formed together, essentially in the manner that Darwin supposed. It should not be overlooked that Darwin clearly recognized the strong difference between the calcareous muds of the lagoons and the coral rock of the reef proper; he recognized also the abundant growth of nullipores in association with reef-making corals, though he did not give to these calcareous algæ the importance that has been ascribed to them in recent years; he naturally knew nothing of the recently discovered action of bacteria in forming the oölitic muds of the lagoon, and he did not discover that the platform in some cases extends along a continental margin farther into temperate latitudes than the limits of the coral zone; for example, southward along the eastern coast of Australia, as was shown by Andrews twelve years ago, and northward along the eastern coast of Florida, as has recently been pointed out by Vaughan. But, let it be repeated, there is at present no sufficient reason for rejecting the idea that, in waters warm enough for the growth of reef-building corals, the reef and the platform have had essentially their present relation during the entire period of forma-

[14] C. Darwin: The Structure and Distribution of Coral Reefs. London, 1842; 2d edition, 1874.

tion of a barrier reef in the larger sense of that term. It is therefore, in my judgment, going too far to say that "an inspection of the admiralty charts for the eastern coast of Australia shows conclusively.....that corals have established themselves on this platform where the conditions favorable for their life were realized," and that "a study of the charts of barrier reef islands... shows that the platforms are independent of the presence of the reefs....for here the reefs are also superimposed on platforms antedating their presence."[15] The occurrence of many uplifted reefs at successive altitudes on certain islands, as in the Philippines, shows that reef-building corals have been, for a long time, growing in the coral seas; hence, if the platform of a barrier reef were formed during slow subsidence, as is eminently probable in the Australian reef, at least, a coral reef may have occupied its margin during the whole period of its growth, just as it does now; and in such case the reef would not be superposed on the finished platform, but would have grown up with it.

Before going farther it should be pointed out that Darwin's postulate of general subsidence over large areas may have to be modified in view of facts discovered since his time; but it should, at the same time, be noted that such modification of his theory by no means invalidates its essential principle, although it makes the action of subsidence in the Pacific Ocean less simple than he regards it in his first paper on this subject.[16] Certain objections that have been urged against Darwin's main postulate are nevertheless irrelevant; for example, it has been urged that, because elevation is proved by high-standing reefs in certain regions, therefore subsidence has not taken place in certain other regions; it would be as fair to argue that, as subsidence is proved by the drowned valleys of certain oceanic islands, therefore high-standing reefs have not been elevated, or to argue that, because high-standing reefs are usually of moderate thickness, therefore barrier reefs cannot generally be of great thickness. Indeed, certain high-standing reefs are found to contour around a previously eroded land surface, instead of resting on a non-eroded surface as is required by the third theory here discussed, and they thus prove that, before elevation, subsidence took place to at least as great a measure as the difference of altitude of the lowest and the highest reefs; and in such a case it must remain an open question, until new details are observed, whether

[15] T. W. Vaughan, *Journ. Wash. Acad. Sci.*, Vol. IV, 1914, pp. 32, 33.

[16] C. Darwin: On certain areas of elevation and subsidence in the Pacific and Indian Oceans, as deduced from the study of coral formations, *Proc. Geol. Soc.*, *London*, Vol. II, 1837, pp. 552–554.

the reefs were formed from lowest to highest during pauses in the subsidence by which the eroded land surface was submerged, or from highest to lowest during pauses in the elevation by which the reefs were uplifted; or some during subsidence and others during elevation. It may not always be easy to recognize whether the contact of the reef with the preexistent land surface is unconformable or not; it must be still more difficult to determine, in cases where uncomformable contacts are found, whether a given reef was formed during subsidence or elevation. Surely not until the nature of the contact of an elevated reef with its foundation has been determined, is it permissible to infer that it testifies only to elevation, and not to subsidence as well.

Another invalid objection that has been urged against the theory of subsidence is that, although a movement of depression may occur in ocean basins on either side of or between groups of volcanic islands, such movement should not be expected on the very site of such islands; but this implies a much fuller knowledge of the relation between vulcanism and diastrophism than we now possess. Subsidence, even of groups of volcanic islands, is, in view of all that is known of the history of oceanic islands, like elevation, a more likely condition than a still-stand.

Besides the consequences that are involved in the statement of his theory of subsidence, Darwin deduced certain others, especially regarding the submarine structure of the total mass: he pointed out that the reef proper "would consist of massive species [of coral] in a vertical position, with their interstices filled up with detritus"; that in the lagoon area "a very large proportion of the rock, and, in some cases nearly all of it, would be formed of sedimentary matter, being in an excessively fine or moderately coarse state"; that "the stratification, taken as a whole, would be horizontal"—the outward-sloping layers of an exterior talus do not seem to have been given special attention—and that in an uplifted reef the horizontal lagoon strata "would more often be preserved to future ages, than the exterior solid reef composed of massive corals in an upright position." These consequences were announced only in a foot note at the end of the fifth chapter of "Coral Reefs," probably because the facts with which they should be confronted were, for the most part, inaccessible; but the contrast here indicated between the mainly horizontal structure of reefs formed during subsidence and the mainly inclined structure of reefs formed by outward growth on their own talus is evidently of critical importance in the study of uplifted reefs. Another consequence of subsidence is that

the reef-mass should be built unconformably upon a surface of subaërial erosion and not upon one of submarine deposition, as has been alluded to above. Unfortunately, so little is now known of the structure of uplifted reefs that they cannot be safely used at present as indicating the origin of reefs that are not uplifted. It would, however, surely seem that the horizontal attitude of the lagoon strata, the occurrence of interbedded sands and gravels near the central island, and the form of the island surface beneath the reef-mass must be critically significant of the conditions under which an uplifted reef was formed. In the case of atolls, borings might detect cross-bedded beach or dune stratification, and an alternation of calcareous layers with guano deposits.

It should be noted that Darwin carefully guarded himself against an undue preference for his own theory by an impartial examination of many others, including those here numbered 1, 3 (omitting solution of the lagoon), 4 and 5, all of which he rejected on good grounds, although recognizing the process of moderate outward growth on a still-standing island as applicable to the island of Tahiti, and, in that case, substituting for the postulate of uniform subsidence the more natural one of subsidence alternating with intervals of rest (Coral Reefs, pp. 128, 130). His readiness to revise his theory is shown in the second edition of his book (1874), in which, as a result of Semper's observations on the Pelew Islands, alternations of elevation and subsidence were recognized as reasonable and possible, if elevated reefs and barrier reefs occur in the same region.

Indeed, after a careful review of many essays on the problem of coral reefs, Darwin's discussion of it in his little book of 1842—to the preparation of which he devoted twenty months of hard work—seems to me more broad-minded and more critical than any other. The great naturalist clearly recognized the desirability of "searching for other evidence of the movements" postulated in his theory, but he adds that "from the nature of things, it is scarcely possible to detect any direct proof of subsidence, although some appearances are strongly in favor of it" (Coral Reefs, p. 147).

There are, however, certain additional and important consequences of the theory of subsidence which were not deduced by its author. One is that subsidence must separate an originally single large island of irregular mountainous form into a group of smaller islands, on which certain members of the fauna and flora—namely, those which cannot migrate and cannot be accidentally transported by wind or water—should show the peculiar resemblances and differ-

ences appropriate to a gradual and long continued evolutionary change from common ancestral forms on an ancient continuous habitat to a modern discontinuous habitat. It may at first thought seem strange that, of all observers, Darwin should have overlooked so significant a matter as this; but it must be remembered that, while he was studying coral reefs, he was not a Darwinian but a special creationist, for when he visited Valparaiso during the voyage of the *Beagle* eighty years ago, he wrote: "I have taken several walks in the country . . . there are very few quadrupeds and birds are not plentiful . . . . I have already found beds of recent shells, yet retaining their colors, at an elevation of 1,300 feet, and beneath this level the country is strewed with them. It seems not a very improbable conjecture that the want of animals may be owing to none having been created since this country was raised from the sea." Under the influence of that ancient biological philosophy, the relationships of the fauna and flora on neighboring islands would have no bearing on the origin of the associated barrier reefs; but under an evolutionary philosophy, it is just as essential that certain plants and animals on islands, surrounded by barrier reefs formed during subsidence, should possess peculiar relationships due to descent from common ancestral forms, as that the shore lines of the islands should, as Dana pointed out, be embayed by the drowning of their valleys.

This line of biological evidence, already briefly referred to, is not so well appreciated by geographers and geologists as by the circle of biologists who have elaborated it. Indeed, the conclusion to which the evidence leads is objected to by some students of earth structure, who, having reached from geological considerations the conviction that continental masses and ocean basins are long-lasting, almost permanent terrestrial features, are therefore disinclined to accept the possibility that a former large land area has sunk to great oceanic depths, particularly if the evidence for so great a change is based only on the distribution of small animals. As against this disinclination it must be recognized that the theory of the permanence of continental masses and ocean basins is based as well on our unavoidable ignorance of crustal structures over the three oceanic quarters of the earth's surface, as on our growing but not yet full-grown knowledge of the remaining continental quarter; it may be further said that the disappearance of various full-fledged mountain structures in the sea, as northeast of Newfoundland, southwest of Ireland, or west of Brittany, and the lateral truncation of large geosynclines by the present continental margin, as in southeastern

Africa, strongly suggest that parts of former continents are now deeply submerged; and finally it should be urged that the detailed biological evidence in favor of extensive submergence is fully as worthy of serious consideration as the general geological evidence against it. The character of the biological evidence is, in essence, as follows:

Imagine several neighboring islands, each of which possesses certain similar yet distinct forms of plants or animals. That these forms were so created, each on its own island, no longer finds a place in biological speculation; for whether the processes of evolution are understood or not, it is agreed on all sides that similar plants or animals are the descendants of common ancestral forms: hence some rational method of accounting for the present distribution of the related forms must be looked for. There are two chief methods: one postulates a still-stand of the islands and some relatively accidental means of transportation, as by tree rafts or storm winds, by which individuals of an ancestral form were carried to the several islands long enough ago for the observed specific differences to have been since then evolved. Two difficulties stand in the way of this method: the first is that no available means of accidental transportation for certain plants or animals across an open water passage can be reasonably imagined, because they are too delicate to survive the exposure to which they would thus be subjected; the second is that, if accidental transportation were formerly available, it ought to operate in modern times as well, and thus produce on each member of an island group, an arbitrarily mixed flora and fauna, including species of recent introduction, that are identical with forms of neighboring islands and species of much earlier introduction that are like but not identical with forms on neighboring islands; for forms of recent transportation from one island to another would necessarily be alike, while those of ancient transportation would now have become unlike. Hence, on islands where such mixtures of species do not occur, this method of distribution must be rejected.

The other method of distribution postulates, first, a former land connection between the now separated islands, and the occurrence of the ancestral species all over this continuous habitat; then a disruption of the land connection in any manner, as by folding, faulting or subsiding, so that several groups of the ancestral species are isolated; thereafter each group varies in its own fashion, and thus the modern differences of the related species are evolved. A standard example of this kind is that of the cassowaries on the

islands north of Australia, described by Beddard in his "Zoogeography."

It is not here possible to mention additional examples of plants and animals on the central islands of neighboring barrier reefs, which indicate the disruption of a former continuous land area by subsidence and which thus give independent confirmation of Darwin's theory explanation of the encircling reefs; but it may be noted that the biologists who have looked most closely into this problem, on the basis of carefully collected specimens, are convinced that isolation by subsidence is its only solution. It may, however, be suggested that the critical point in this argument is the determination of "identical" and of "related but not identical" forms in species not subject to accidental transportation. It would therefore be fair to demand that identity and resemblance should be so sharply differentiated that, if a large collection of forms in groups of a dozen from each locality, regarded as "identical" and as "related but not identical" by their collector, were mixed (each group of a dozen being kept together) without labels, they could be classified by another biologist in essentially the same species that had been previously established with the aid of the collector's labels; for if the classification depends on a knowledge of the locality, as well as on a study of the specimens, non-zoological students will hesitate to accept conclusions based on species thus made.

The most manifest consequence of the theory of subsidence that was overlooked by its inventor has already been alluded to: it is that, as an island subsides, it must not only diminish in size, but it must also acquire a more or less embayed shore line as a result of the advance of arms of the sea into its previously eroded valleys. That so evident and inevitable a consequence of subsidence should have been overlooked is singular enough, and all the more so since Darwin had recognized the occurrence of long bays entering the central islands of barrier reefs; he probably attributed them to marine erosion, after the fashion of his time. His omission was remedied by Dana,[17] who, imperfectly anticipated by De la Beche, first recognized and explicitly stated the important principle that the partial submergence of a dissected land surface must produce coastal embayments. He rightly used this principle in giving independent confirmation to Darwin's theory. It is interesting to note

[17] J. D. Dana: Corals and Coral Islands. 1st ed., 1872; 2nd ed., New York, 1879. The results of Dana's observations, made on Wilkes' Exploring Expedition (1838–1842), were previously published in his Report on Zoöphytes (1846), treating at length of coral reefs and coral animals, and in a chapter on Coral Reefs and Islands (1849) forming a part of his Geological Report in the Report of the Wilkes Expedition.

that Darwin came very near discovering the principle himself; for while he was in Chile he made an excursion from Valparaiso to the base of the Andes, when he noted that Chile "is traversed by several lines of high hills parallel to the great range . . . At the foot of the Andes there is a succession of level basins . . . These basins or plains, together with the flat valleys which connect them with the coast, are the bottoms of ancient inlets and great bays, such as, in the present, intersect every part of Tierra del Fuego and the west coast of Patagonia, etc. Chile, at one time, must have, in the configuration of its land and water, exactly resembled these latter countries. This resemblance was occasionally seen with great force, when a fog bank extended over the whole of the lower parts; the white vapor, curling into all the ravines, beautifully represented the little coves and bays. Here and there a solitary hillock peeped up through the mist and showed that it had formerly stood as an islet."

How curious that a mind as alert as Darwin's did not make the easy step from the floating fog to a rising sea! More curious still that he did not, fifteen years afterwards, notice Dana's explicit explanation of the origin of embayments by subsidence, and seize upon the confirmation thus given to his own theory; but singularly enough no use is made of Dana's principle in the second edition of Darwin's "Coral Reefs" (1874), although Dana is repeatedly quoted there on other topics. The reason for this omission is probably to be found in Darwin's absorption at that time in the discussion of the origin of species; or perhaps in the inattention of one geologist to the writings of another, regarding which Darwin wrote in 1844 or 1845 in a letter to a friend: "As for your pretending that you will read anything so dull as my pure geological descriptions, lay not such a flattering unction on my soul, for it is incredible. I have long discovered that geologists never read each other's works, and that the only object in writing a book is a proof of earnestness, and that you do not form your opinions without undergoing labor of some kind. Geology is at present very oral, and what I here say is to a great extent true." (Life and Letters, Vol. I, pp. 334, 335; Amer. edit., Vol. I, p. 303.)

(*To be concluded*)

A COLLUVIAL SOIL AND ITS PEOPLE

By F. V. EMERSON
Louisiana State University

It is a matter of common observation that, in most regions of mature topography, the majority of the houses are situated in the valleys rather than on the steep-sloped ridges. Here water is usually easily obtained, the easier grades invite the main roads and, finally, the fertile soils are to be found in the valleys or "bottoms."

But the bottom soils in a rugged region should not be confused with those soils of the same name on a flood plain which are so common in the flat-floored valleys characteristic of middle and late maturity. The latter soils are distinctively alluvial, while the former are colluvial soils and are due to soil creep rather than stream deposition. However, it should not be forgotten that, while soil creep is most pronounced in rugged regions, the process is well-nigh universal, for, wherever there are slopes, steep or gentle, there must be a gentle movement down slope; "a movement," says Professor Davis, "of land waste so slow that it is not generally noticed ...a slow wasting and creeping of the waste down the land slopes, not bodily or hastily but grain by grain, inch by inch..... With countless minute changes every particle is led, slowly but surely, from higher to lower ground."

Where slopes and other conditions are favorable, the movement locally becomes a landslide, an unpleasantly familiar feature in some mountainous regions and also in the sub-polar regions, where Hobbs and Andersson have described the "stone rivers" which, impelled by frequent freezing and thawing, move down valleys. But, in most cases, the phenomena of soil creep is overlooked and it is only in regions of steep slopes that its results become economically important.

The area on which this paper is based is Miller County, Missouri, one of the Ozark counties. The Missouri Ozarks, as a whole, consist of a limestone plateau, once well worn down almost to a plain (peneplain) and later elevated so that the streams have eroded wide valleys which are separated by narrow divides, a region so hilly that the usual term, "Ozark Mountains," is not inapplicable. Near the main streams, erosion has indeed produced a topography that consists entirely of slopes except for some narrow strips of flood plain, a belt known locally as the "river brakes"; while, further

back from the zones of active erosion, the old level surface of the old plain extends as "prairie" until the next important stream has produced a belt of "river brakes."

Like most limestone soils, these Ozark soils are usually heavy, fine-grained silts and clays, but, since the limestone is flinty, the slowly decaying flints are left scattered through the soil. The soils belong to the Clarksville series which overlie much of the Ozarks and also considerable portions of the Allegheny Plateau.

These soils when soaked with water tend to creep down slope somewhat like an overloaded sheet of water, but, of course, very much more slowly. When the soils on a slope are frozen, the solidifying water in the soil spaces expands and slightly moves the grains and, again, when thawing occurs, the grains sink back, not vertically, but diagonally down slope. Again, the surface run-off carries fine particles down the slopes. Thus, as a net result of these factors, the finer silts and clays move more rapidly than the cherts, so that the latter are relatively left behind in the down-slope journey. The principal variant in these soils is that of slope, so that the soil varies mainly with the steepness of the slopes; on the level prairie are the silt loams and clay loams which extend down the gentle slopes; on the steep slopes are the stony loams which grade into the colluvial soils near the slope bases.

Thus the hillsides are stony because of the faster movement of the finer soils and are almost invariably covered with a veneer of stony loam. The finer silts move down slope until, near the base of the slope, they accumulate and here lessen the steepness and so facilitate further deposition. As a result a "shoulder" of fine detritus, with its outline often convex to the sky, is formed near the foot of the slope.

This is the colluvial soil strip which is so important in the mountain valleys. The torrential valley stream usually has deposited a narrow belt of stony waste in the colluvial strip, waste that has little agricultural value. The colluvial soil is best described as silty, or technically, it varies from a clay loam to a silt loam. It is generally more sandy than the somewhat stiff upland soil because of the particles of decomposed chert that have moved down slope. The diagram (Fig. 1) shows the general relations of these soils.

Such a colluvial soil is light enough for good tilth and sufficiently porous for good drainage in rainy seasons. It is usually well supplied with moisture both from the seepage water in the valley and from the capillary water which rises from the subsoil to the root zone.

The inhabitants fully realize the importance of these narrow soil belts and generally they are in a high state of cultivation. Farms are large, but a farmer's acreage wealth is estimated more in proportion to the "bottom lands" he owns than to his total acreage. A large acreage of hillside stony loam, which is mostly used for pasture, is balanced by a much smaller acreage of "bottom land" which is expected to furnish the hay, corn, wheat and truck. In laying out the roads that run through the valleys as little colluvial soil as possible has been included. The roads run on the stony loams less than a rod from the smooth colluvial soils and the traveler, jolting along a stony road, looks longingly at the smooth fields but a short distance away. Corn, wheat and alfalfa are the favorite crops and the yields are ordinarily large.

There is the usual response of the people in the "river brakes" to their rather unfavorable environment. Communications are

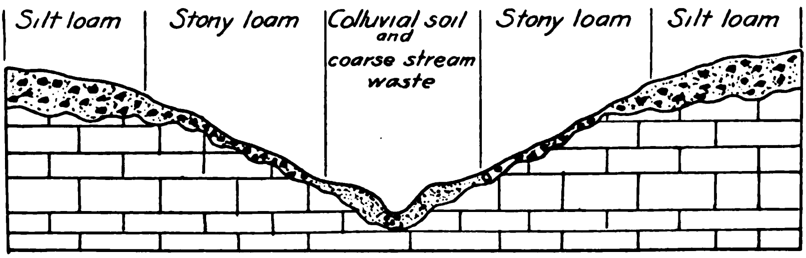


Fig. 1—Diagram showing showing the general relations of the colluvial soils. The vertical scale is much exaggerated.

often difficult and crop yields are not large. Their modes of life and of work are largely those of several generations ago. Local idioms, so numerous as almost to constitute a dialect, are still heard but are rapidly becoming obsolete. The daily paper and the schools have brought culture to many homes, as the people are, for the most part, eager for education. The region was largely settled from the Cumberland Plateau of Tennessee and Kentucky, the close resemblance to which in topography, soils and climate was undoubtedly a factor in attracting immigrants to the Ozarks.

A prophecy of a widespread future response to soil creep was seen on the farm of a German who probably brought from oversea his thrifty management of hillside soils. He has built across his stony, hillside pasture a rough retaining wall and behind this wall the soil creep is building a narrow terrace of very fertile soil. Such an example is most interesting as indicating a utilization of

soil creep when population shall have become denser and agriculture very intensive. Then, it is safe to predict, the stony slopes of many of the limestone hills will show a succession of terraces from base to summit; but such intensive methods are several generations in the future.

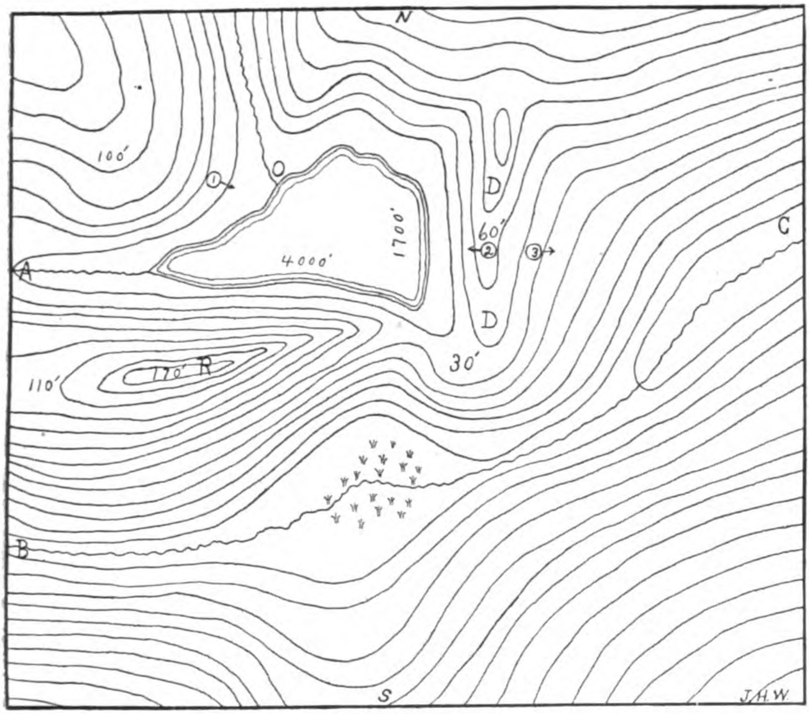
While not strictly pertinent to the topic of this paper, it may perhaps be worth while to allude to a politico-economic difference which often crops out between the prairie dwellers and the residents of the "brakes," the "hill billies," as they are often called. The latter very naturally oppose any increase in the county taxes, for their income is, at best, scanty. In the county under observation the opposition of the "hill billies" had repeatedly defeated a proposition to build a new court house. The authorities from the prairie districts found that, while they could not construct a new court house without a favorable vote of the people, they were allowed by law to make repairs practically without limit. So the old court house was "repaired" by practically building a new structure around the old one.

Summarizing, we have in the area described a maturely dissected limestone plateau where soil creep is necessarily important. The colluvial soil accumulates in a narrow belt near the foot of slopes and is extremely important both because of its fertility and because of the scarcity of arable lands.

A GLACIALLY FORMED LAKE IN SUSQUEHANNA COUNTY, PENNSYLVANIA

By J. HOWARD WILSON, Ph.D.

An interesting case, in a small way, of the changing of preglacial drainage and the formation of a small lake by the deposit of glacial material across an older valley is found at Quaker Lake in Susquehanna County, Pa. It is one of a number of small lakes or ponds in that region and lies close to the northern boundary of the county less than nine miles as the crow flies from Binghamton, N. Y.



Sketch map of Quaker Lake in Susquehanna County, Pa. Approximate scale, 1:35,000. Contour interval, 20 ft. The letters are explained in the text; the numerals in circles with arrows represent the viewpoint and direction in which the three photographs were taken, the numbers corresponding to those of the figures. The map is not claimed to be accurate, but it shows the phenomena described. Some of the distances were roughly measured by pacing. The elevations were estimated or made by aneroid.

At this point, in preglacial times, two small valleys (A and B; *cf.* map), separated by a ridge of Upper Devonian shale and sandstone (R), united to form a fairly deep valley (C) which descended in a

generally easterly direction until Snake Creek was reached, the latter proceeding in a northeasterly direction and emptying into the Susquehanna River some ten miles above Binghamton. The two small valleys or forks have an east-and-west direction, *i. e.* at right angles to the general movement of the ice.

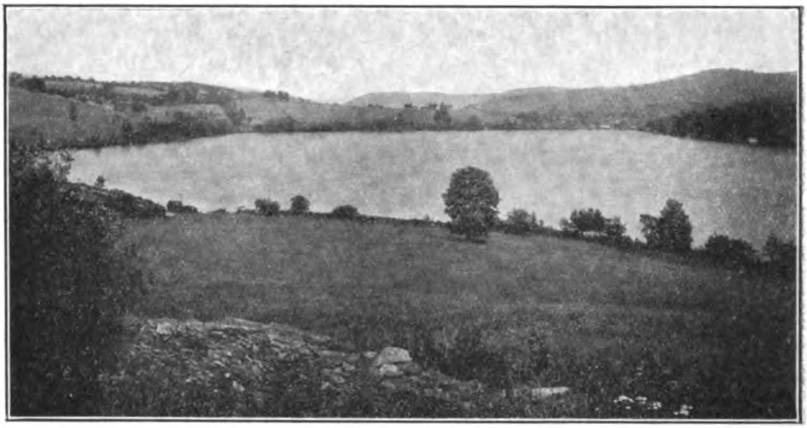


Fig. 1.

Fig. 2.

The lake was formed in the northern fork (A) by the building out, from the northern side of the main valley at point of forking, of a till-like deposit (D), with gravelly surface, which, with descending slope, crossed the valley at the end of the dividing ridge which it closely abutted, completely closing the northern fork and

somewhat impinging on the southern one. This caused a lake to be formed in the northern fork and a marsh which was perhaps originally a shallow lake in the southern fork. The lake is about two-thirds of a mile long and one-half mile wide, and depths obtained from persons residing in the vicinity seem to agree with the slope indicated by the elevation of the valley above the lake (A) and that below the glacial dam (C). The glacial dam, as shown in Fig. 1 and seen from that point, is so plain and the older valley side from which it springs so distinct from it, that it appears almost artificial except for its size and diminishing height. Even at its southern portion, where it abuts against the end of the ridge (R), separating the two forks and thus forming the lake, it is still some thirty feet above the lake level, so that the lake, before overflowing here, found

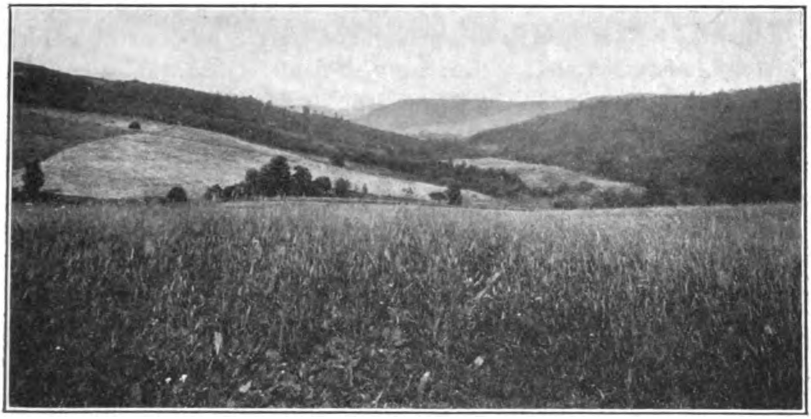


Fig. 3.

an outlet (O) on the northern rim of its basin. In Fig. 1 the outlet is in the hollow on the nearer shore to the left. The drainage of the fork thus, instead of flowing easterly into the main valley and then to Snake Creek, as in preglacial times, now flows north into an entirely different valley.

Fig. 2 taken from the glacial dam, looks up the lake to its narrow and shallow end and shows the effect of the impounding of the waters of a normally formed preglacial valley by the glacial dam. The outlet is here shown at the further shore to the extreme right.

Fig. 3 is taken from the dam in an opposite direction from Fig. 2 and shows well the lower and deeper part of the valley below the dam.

RELATIONS OF ABORIGINAL CULTURE AND ENVIRONMENT IN THE LESSER ANTILLES

By J. WALTER FEWKES

In late years the geologist, climatologist, and oceanographer have largely increased our knowledge of the Lesser Antilles, and naturalists, especially students of fauna and flora, have made important contributions to what was known of the distribution there of animals and plants. The ethnologist and archeologist are now able to give a clearer picture than ever before of aboriginal culture history in the Antilles in pre-Columbian times.[1] In this wealth of material gathered by the specialists the student of the relation of culture history to environment will find a rich field for his studies.

That large part of modern geography dealing with the relation of the earth and man has hardly considered this material, possibly on account of its extent, or the probability that any generalization on what is now known would be premature, so rapidly are new facts accumulating in this field.

In the following pages the author has ventured to consider one aspect of the relation of Antillean culture history to environment, and has limited himself to the aborigines, or so-called pre-Columbian inhabitants, and those features of the physical surroundings that have directly affected them.

Among the influences that have powerfully affected man in the West Indies are geological features, climate, ocean currents and winds, fauna, and flora. Among geological influences may be mentioned contour and relief, extent of coast lines, stability and distribution of land that can be cultivated, and different kinds of soils or rocks. Climate has affected agriculture more than any other physical environmental condition by determining the animals and plants available for food. Currents and winds are powerful agents in distributing organic life and determining the direction of human migrations on the ocean.

Physical Features. The Lesser Antilles, with the exception of Trinidad and Barbados, resemble a chain of volcanoes, or their

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[1] The author will later publish an elaborate account of Antillean prehistoric culture based on the magnificent collection of West Indian Antiquities owned by George G. Heye, Esq., of New York.

summits, projecting out of the ocean. Some of these islands rise abruptly from the sea, while others have fringing coastal plains. Volcanoes are, from time to time, active, and igneous rocks predominate. The coast lines are continually changing and relief forms are not constant.

Fertile plains suitable for agriculture exist in many islands, and the shores of drowned river valleys present easy landing places for canoes or small craft, while submerged craters afford landlocked anchorage for larger vessels. Several of the islands are destitute of fresh water, while others have copious streams. In Dominica, the natives say, there are "as many rivers as there are days in the year," but the tufaceous rocks in other islands drink up the rain water before it forms a stream or gets to the sea. In islands having calcareous formations, evidences of former extension of the coast into the sea or elevations of the coast, due to volcanic or other agencies, are shown by the existence of living and semi-fossil genera of shells, echinoderms and corals high above the sea level. Changes in coast lines are common; and in the volcanic islands are abundant lava flows, one superimposed on the other, enabling the observer to measure the extent of the phenomena. The hard volcanic rocks supply material for stone implements; good clay on several islands invites the potter to her work. Sea shells, like *strombi,* have replaced stone for implements in islands like Barbados where there is no rock suitable for stone implements. The igneous boulders, being hard enough to resist rapid aërial or aqueous erosion, have preserved pictures cut upon them by the aborigines, but many of the rock cuttings were so shallow that they are either almost completely obliterated or barely legible.[2]

The longer axes of several of these islands extend approximately north and south, and, as they lie in the tropics where the trade-winds are constantly blowing from the northeast, their eastern side, or as it is called, the windward side, is almost constantly beaten by a heavy sea; on that side also the coast is much more eroded than on the western. On the latter side, however, the winds and waves not being so high, sandy beaches are more common and landing in small crafts is less difficult. The prevailing winds thus brought it about that the best sites for aboriginal settlements were on the lee sides of the islands, where the archeologist finds village sites, or middens, most abundant.

[2] Locally the boulders on which these pictographs occur are called "jumbies" or "altar" stones, the latter term implying a belief in their former use in sacrifices. The West Indian pictographs resemble those of Porto Rico on the one hand, and of British Guiana, on the other, and generally occur near the shore or on the banks of streams, convenient to landing places.

Natural caves occur in many of the islands, more especially those composed of soft calcareous rock or easily eroded tufaceous deposits. These caves, in some of the islands, as objects found near them show, were resorted to for mortuary and religious purposes. Many of the islands have no forests, few contain remnants of the original tropical jungles; others are destitute even of bushes; such an island as Antigua has no fresh water except that gathered in reservoirs.

Climatic and Hydrographic Conditions. The Lesser Antilles lie wholly within the tropics. Their temperature, however, is largely tempered by the ocean. The northeast winds blow so strongly that each island has two distinct climatic regions, the windward and the leeward, one under the régime of constant, cool ocean breezes and the other sheltered by highlands, with quiet water and low surf. As the islands have moderate elevation, the difference in temperature on the two sides does not profoundly affect the rainfall, although it has led to the concentration of a maritime people on the coast less exposed to surf raised by these winds.

The direction of the ocean currents has brought it about that, biologically, these islands are connected with South America, and we may suppose the original peopling of the majority of them was from that continent, either directly or indirectly. The great river, Orinoco, which discharges a volume of fresh water sufficient to render the Gulf of Paria, Venezuela, brackish, has had an important influence on the migration of plants and animals, especially marked in the fauna and flora of the southern members of the Lesser Antilles. Drifting logs that have floated from its delta to Barbados have no doubt carried reptiles, insects, seeds and even higher animals that would otherwise have been drowned. Floating trunks of trees, bushes and plants that could retain vitality in the salt water have been stranded on the islands. Paddles from Indian tribes dwelling in the Orinoco delta are, from time to time, found on the east coast of Trinidad. Ocean currents have likewise brought to the island organisms that live on the banks of the Amazon, and have, in that way, reached the Lesser Antilles from the land to the south rather than from lands to the west or north. But in the Greater Antilles, as Cuba, it is different; there the ocean currents set from the west, eastward, rendering these islands biologically allied to Central America rather than South America. The peopling of islands by man in early colonization follows much the same laws as that of plants and animals.

The South Equatorial Current crosses the Atlantic to the Caribbean Sea and, following the northeast and north coasts of South

America, impinges upon the shore, receiving what is discharged from large rivers and bearing its burden of life to its destination. There is little wonder that the Lesser Antilles, set like a net across its course, should capture some of the flotsam it bears. More than that, if the Gulf Stream can carry floating objects to Europe from the Gulf of Mexico, the Equatorial Current may have brought to the Lesser Antilles floating logs with clinging animals and plant seeds from the coast of Africa, across the Atlantic, not half the distance.

Biological Conditions of the Lesser Antilles. The land animals and plants, which practically supply the food of man, are largely dependent on the degree of heat or cold, moisture or dryness; in other words, on the climate of the region in which man dwells. The amount of heat and cold is due to elevation and latitude, ocean currents and prevailing winds, rainfall and other agencies. Moisture or dryness depends on the mutual relations of the earth, water, and air. The rainfall, land relief, nearness to the ocean, prevailing winds, ocean currents, and other causes, determine the character of the biota brought by ocean currents, winds or human agencies. This migration of the fauna and flora is partly voluntary, partly involuntary. Ocean currents have been perhaps the most effective agents in the involuntary transportation of plants and animals, but cultivated plants and domesticated animals have been carried by human agencies from one place to another. Such land animals as insects, lizards, and small mammals supplied considerable food, but there were no domesticated animals of size and the amount of food from terrestrial animals was never very large. The seas around the islands contain much animal food, as fishes, crabs, and mollusks, the last two being mainly collected from the shore laid bare by the high tide. Judging from the number of crab carapaces, and claws of the same, found in the middens on some of the islands, it would appear that crustacea supplied the aborigines with much of their food.

The importance of ocean currents, in the distribution of animal and plant life, has two aspects: (1) the regions of the adjacent continent to which the Antillean fauna and flora are related; (2) the animals and plants, occurring on these islands, that can be used as food. A distinction must be made between cultivated plants and domesticated animals brought by man, and those that have been transported by natural means, as winds or currents.

The food plants that played an important rôle in forming human culture on the Lesser Antilles in prehistoric times are the yuca or

manioc, the yam, potato, and various other roots. Maize may have been used as a food but not to the same extent as the roots above mentioned. The banana was made into a paste and dried in the sun; cocoa was grown by the aborigines, but not in great quantities. A favorite drink was an intoxicating liquor called the *ouycou,* manufactured from yuca meal which was fermented in large earthen jars. Most of these food plants were apparently brought by man from South America, his continental home. The flora of the Lesser Antilles is distinctly South American, and not allied to that of Central or North America.

In the same way it may be said that the fauna of these islands follows the same law; its natural affinity being with the great continent to the south. Few if any animals were carried to these islands by man in pre-Columbian times and it may be supposed that those used by man as food found their way there by natural means or unaided by man. The small mammals, reptiles, birds, and insects are akin to South America rather than to the Greater Antilles or North America. Several instances might be mentioned to illustrate this statement, but the following is sufficient, in a cursory treatment. The natural distribution of animals in the Antilles, according to Sir Harry Johnston, is well illustrated by the serpent fauna of Cuba, as compared with that of the Lesser Antilles: "In their serpent fauna," he says, "the southern groups of the Lesser Antilles (Guadeloupe to Trinidad) are more 'continental' and South American than is the case with the Greater Antilles." ... These last, be it noted, are absolutely unconnected, in the affinities of their reptilian fauna, with Florida and North America, but offer some relationship to southern Mexico and Central America. These indications as to past land connections or approximations are further borne out by plant, bird, spider, fish and mammal distribution showing that the Greater Antilles have had no nearer neighborhood with the North American continent since the middle of the Secondary epoch (if then); that their last ancient land connection (Early Tertiary?) was with Central and not with South America: and finally that they, to some extent, shared with tropical America a connection with, or approximation to West Africa, perhaps as late as the beginning of the Tertiary Epoch."[3]

As Johnston has shown, the relations of the bat fauna of the Greater Antilles (Cuba, Haiti and Jamaica) are important. According to this writer, out of twenty genera of bats only one is

[3] The Scenery of Cuba, Hispanola, and Jamaica. By Sir Harry Johnston. *The Geographical Journal*, June, 1909.

North American, three are peculiar to the Greater Antilles, and sixteen are found likewise in Central America.

Culture of Aborigines on the Lesser Antilles. Eliminating from our consideration Trinidad and Tobago, which belong culturally, as well as geographically, to the South American continent, we can detect traces of three distinct aboriginal cultures in the Lesser Antilles, *viz.*—(1) cave dwellers, or fishermen, hunters, fruit and root eaters; (2) agriculturists, "meal-eaters" ("Arawak"), who cultivated food roots by primitive methods; and (3) Caribs, a vigorous modification of the latter who obtained some of their food in the same way as the preceding, but lived mostly by raiding other islanders.[4]

It is probable that the most ancient aborigines of the West Indies inhabited caves, and it is known that survivals of these cave dwellers were mentioned in 1492 as inhabiting the western end of Cuba, the extensions on the western end of Haiti and Jamaica, which had become largely agricultural, and other islands. In many of these islands, however, traces of the cave life were even then archeological and legendary, but evidences of a preexisting cave life in all are almost universal. The agricultural or meal-eating culture was most highly developed in Porto Rico, Haiti and eastern Cuba, but traces of it existed in the Lesser Antilles, where the Caribs were dominant.

The inhabitants of the Lesser Antilles were more aggressive than those of the Greater Antilles, and among them a modification of the agricultural culture, called Carib, had been developed.

The derivation of Antillean man has been variously interpreted.[5] The available evidence seems to point to the conclusion that the original peopling of the Lesser Antilles was from South America, but we do not know whether, at the time it occurred, the Antilles were a part of that continent or of a much more extended island now partly submerged in the ocean. Early man may have inhabited the Antilles much earlier than is generally supposed, or at a time when those many likenesses in the biota of South America and Africa originated.[6] The aboriginal race had lived in Porto

[4] The word "Indian" is applied by the present West Indians to the coolies, or laborers who were imported from India to work in the fields. As pointed out by Mr. Payne, in his "History of America," the word "American" was applied to our aborigines up to the Revolution, but since that time it is generally used to designate a citizen of the United States. The present inhabitants of the Lesser Antilles call all prehistoric inhabitants of the island "Caribs" and all implements, pictographs, middens and pottery fragments are designated as "Carib."

[5] The reader will note that nothing is said about the provenance of the first human colonists in the Greater Antilles.

[6] There is considerable literature on resemblances between freshwater fishes, insects and other animals of South America and Africa.

Rico and Haiti long enough to have evolved a highly developed neolithic stone age culture, as evinced by the perfection it attained in stone working, unsurpassed anywhere in America. But there is evidence that the earliest man was a cave dweller, and that he was followed by an agriculturist and, the author believes, that the Carib was evolved from the agriculturalist ("Arawak"?) as a direct outcome of a food quest which could only be satisfied by plundering neighbors.

There are several theories regarding the origin of the Caribs in the West Indies. It is held by some of the early authors that this race was an offshoot from North America, but this theory is now quite generally abandoned. Others have derived the insular Caribs from South American Caribs mainly on the ground of linguistic affinities and certain legends which are not wholly reliable. That there are linguistic relations of continental and insular Caribs goes without saying, but there are also linguistic likenesses between all the known Antillean languages and those of South America, and it is yet to be shown whether this differentiation of the Carib language occurred before or after their ancestors left South America. Sir E. F. im Thurn has derived the Guiana Caribs from those of the Lesser Antilles, instead of the latter from the former. The author suggests the theory of an independent origin of the Caribs of the islands and those of the continent and ascribes their linguistic and other similarities to ancestral racial likenesses.[7]

If the Caribs in the Lesser Antilles originated from South America and were racially the same as those of the Orinoco, how does it happen that some of them did not settle in Trinidad, which lies between the Carib islands and Venezuela? The same implied objection, slightly modified, may be made to im Thurn's theory.

It may be that the indefinite use of the word Carib by some early writers has led to a grouping of all marauders into an unnatural group. Archeological objects found in these and other Lesser Antilles indicate a sedentary agricultural race of which the Caribs may have been renegades, not a distinct race culturally.

Cave-dwelling Culture. There are evidences that an original cave culture, which preceded the agricultural survivors in the Lesser Antilles, continued in the West Indies even when the inhabitants had practically passed into the agricultural state. As among the aboriginal pueblo people of our Southwest, cave dwellers

[7] The designation Carib, according to Oviedo, is an Arawak word meaning a warlike or fierce people, but not a distinct race. Dr. Chanca, to whom we owe the best account of the second voyage of Columbus, says that the Caribs occupied three of the Antilles, Guadeloupe, Dominica and Ay-Ay (St. Croix?).

and those who lived in habitations free from cliffs coexisted side by side, in early times, wherever there were caves. The prehistoric West Indian agriculturalists gave Ramon Pane legends of their former cave life, as has been elsewhere pointed out.[8]

The author's search for evidences that the numerous caves in Trinidad were inhabited was not rewarded with success. Several natural caverns near the pumping station, on the road from Port of Spain to Diego Martin's Basin, were explored with a hope that evidences of former habitation might be found in them, but these visits were not successful; and up to the present time, no evidences of cave dwellers has been reported from Trinidad. In Barbados, where there are geological formations that are readily eroded, caves are common and evidences of cave dwellers are not far to seek.

There are evidences that the series of natural caves at Mt. Gilboa in St. Lucy's Parish, Barbados, were inhabited in prehistoric times, and the so-called "Indian Castle," described by the Rev. Griffith Hughes,[9] in 1750, was undoubtedly artificially excavated by the hand of man. This "castle," which lies about three miles to the east of Six Men's Bay, in Barbados, is a remarkable excavation and, if aboriginal, as the author more than suspects, it is the only aboriginal, artificial cave recorded from the Antilles. According to the Rev. Mr. Hughes, prehistoric shell chisels and an idol, which he figures, were found in or near this cave.

An examination of the floors of rock shelters, common in Barbados, has yielded evidences that they were inhabited. Artefacts of aboriginal manufacture have been found near their entrances, showing that they were habitations. The resemblance of these implements to those found in fields indicates that their makers were culturally not very unlike those dwelling near the middens along the lee shore of the same island. Available evidence that the ancient Barbadians lived both in caves and in pit rooms or artificially excavated chambers will be presented in detail in a later publication.

Several other islands of the Lesser Antilles have natural caves where evidences exist of former habitation by prehistoric man. The marks of human tools are not wanting on the walls of these caves, but, thus far, no efforts at systematic exploration of their floors have been made. The following quotation from Father Labat is instructive as showing the use of caves as burial places: "There is to be seen at Désirade, a little island to the windward off the coast of Guadeloupe, a very deep cavern almost full of bones with re-

[8] Cave Dwellings of the Old and New Worlds. *Amer. Anthropologist.* 1900.

[9] The Natural History of the Island of Barbados. By Rev. Griffith Hughes, A.M., Rector St. Lucy's Parish, London, 1750.

mains of bows and clubs and other arms of the ancient Indians; it was apparently a cemetery."

According to an old author, the women of Martinique had caves in which they lived or to which they retired at times. "They have great and strong caves or dens in the ground to which they flee for safeguard in case any men resort unto them at any other time than is appointed, and then defend themselves with bows and arrows." These same caves may be the "holes" to which Davies refers when he writes, "Thus the Arouages are forced (by the Caribs) out of their holes, to fight in the open field or run away." While it is not impossible that some such structures as pit dwellings were referred to in these accounts, the logical conclusion would seem to be that they were caves or rock shelters.

No evidences of cave habitations were found at St. Kitts or St. Croix, but they have been reported from the island of Guadeloupe, In many of the Antilles, caves that once furnished habitations for man became mortuary or religious chambers. The use of caves for religious purposes in the Greater Antilles is well known. The author will instance one cave in the Lesser Antilles in which religious objects have been found although there are several others where mortuary remains have been discovered and therefore connected with ceremonies. This cave[10] is situated in Batowia, an island near Balliceaux, off St. Vincent; it has several niches in the walls one or more of which may have been used for idols. In this cave a sacred seat was found, several years ago, and taken to England, but its present whereabouts is unknown to the author.

Agricultural Culture. In almost all the Lesser Antilles the majority of aborigines had either abandoned cave life, and passed into the agricultural stage, or, as is generally the case, the two existed side by side. In those islands where there were no natural caves, it goes without saying that the inhabitants built huts in the open. The natives were agriculturalists and fishermen, including in the latter group those that made the shell heaps and middens, but this agricultural stage was not always uniformly developed; the objects found show diversity in form and degrees of technique and are more or less modified in different islands into typical forms. Certain well-defined subareas can thus be determined by the character of the artefacts which occur in certain islands or clusters of islands.

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[10] This was the cave where the late Mr. Frederick Ober found the wooden turtle mentioned and figured by him in "Camps in the Caribbees," and by the author in his "Aborigines of Porto Rico."

This difference in culture areas in the West Indies, as determined by implements, may be illustrated by a comparison of the aboriginal objects from Porto Rico with those of the Lesser Antilles. Several typical aboriginal objects found in Porto Rico have not been duplicated in any other West Indian island except Haiti, and, conversely, many objects from the other Antilles have not yet been reported from Porto Rico. It may rightly be supposed that the forms of these prehistoric Porto Rico objects were evolved quite independently of those in other islands; and as these characteristic objects do not exist in either North or South America, it is probable that they originated on the islands where they are found. In the same way, many stone objects occur only in the Lesser Antilles, and do not recur on either continent, or on any of the Greater Antilles, which limitation very naturally leads to the conclusion that they also were autochthonous and restricted in origin to the islands where they are found. The archeologist can judge the characteristics of culture only by artefacts, and before he can classify prehistoric cultures in the Lesser Antilles, preceding the advent of the whites, it is necessary to examine large collections from each island, and compare them one with another in order to determine the types peculiar to geographical areas. This is somewhat difficult when the source of specimens is doubtful; and reliable only when large local collections are compared. A study of these shows that different islands of the Lesser Antilles were not uniform in culture, and has led the author to a division of the Lesser Antilles into subareas, based on cultural and geographical data.

The sites of habitations or refuse heaps in the Lesser Antilles are now indicated by middens and shell heaps. Buildings of stone or any form of walled enclosures may have existed but are not known to have been constructed by the aborigines of the Lesser Antilles. Even the stone circles, called ball courts or *batey*,[11] of Porto Rico and Haiti, have not yet been found in these islands. Mr. C. B. Brown, in "Indian Picture Writing in British Guiana," has described one of these *batey*, once supposed to be characteristic of the Antilles, from the Pacarima Mountains in Venezuela, an instructive observation connecting South American and Antillean cultures.

Contiguity to the sea is a necessity for fishermen, and the small inlets that rivers or streams make in the coast would afford good

[11] The author has been informed that there is an enclosure that may have been of this nature in Carriacou, but he has not visited it.

fishing as well as fresh water.[12] Another reason for dwelling near the streams is given by Davies, in the following lines: "The inhabitants of the Caribbees are also desirous to be somewhat near springs, brooks and rivers because of their washing themselves every morning before they put the red paint on their bodies."[13]

Two kinds of houses, known as the secular and religious, were constructed by the aborigines of the West Indies, as is almost universally the case with man in primitive stages of culture. The latter served as the habitation of the head medicine man, or chief, but was also the god house or place where the idols (Zemes) were kept. It was generally larger than the other dwellings and occupied a more central position, the huts of the remaining people being commonly grouped about it. As these houses are described by many authors, one of the best, that from Labat, will serve to show their character: "Each family" he says, "composes its own hamlet, for the father of a family has his house where he lives with his unmarried children and wives, all the other children who are married have their establishment and their respective houses. They build one house common to all, called a carbet, which has a length of sixty or eighty feet, and is constructed of forked boughs, eighteen or twenty feet high, planted in the ground every twelve feet. They lay over these, branches of the latimer or other trees, perfectly straight, which answer as a plate on which they place the rafters extending down until they touch the earth; these they cover with reeds or the leaves of the Bourbon palm; so that it renders the interior of the carbet quite obscure, for no light enters except through the front door, which is low and only allows one to enter by bending down. The boys keep the carbet clean and sweep out the house and surrounding plaza. The girls and women clean their houses, [the men and boys the sacred house.] At the side of this carbet there is one special door by which the priest enters when his god calls him: he alone is allowed to pass this door."

The aboriginal villages of the West Indian agriculturalists, the sites of which are now indicated by middens, were probably not unlike those in Guadeloupe, described as follows:

"Here they found innumerable villages of twenty or thirty houses, at most, set round about an open space, like a market place." "And forasmuch," says Peter Martyr, "as I have made mention of their houses, it shall not be greatly from my purpose to describe

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12 While it is not unusual to find evidences of village sites situated inland, from necessity they rarely occur very far from fresh water, and are generally on the coast.

13 The early accounts generally state that the Caribs were painted by their women.

in what manner they were builded. They were made round like bells or round pavilions, their frame is raised of exceedingly [high] trees set close together and inserted in the ground, so standing aslope and bending inward that the top of the trees join together and bear one against another, having also within the house certain strong and short posts, which sustain the trees from falling. They cover them with the leaves of date[?] trees, and other trees strongly compact and hardened wherewith they make them close from wind and weather. To the short posts or props within the house they tie ropes of the cotton or gorsapine trees, or other ropes." . . . . "At the entrance of one of the houses they found two wooden statues, with serpents wreathing round their feet, and they found looms, in which the natives wove a sort of carpet, and all kinds of earthen vessels."

The sites of these villages are now indicated by low mounds or middens, sections of which are often revealed by encroachments of the sea or by streams flowing near them.

As skeletons sometimes occur in these sites, reference to burial customs may be mentioned here. The ancient Antilleans buried their dead in a contracted (embryonic) posture, often in the floors of the houses; and we have an early record of a chief of Dominica who was buried in the middle of his dwelling, after which the house was abandoned. The natives were accustomed to make the grave in the same house where the person died, or in a new house built for that purpose. The dead were sometimes seated on their heels, the two elbows on the two knees, the head resting in the palms of the two hands. The author has found burials in the Carib cemetery at Banana Bay, in the island Balliceaux,[14] in the same position as above described by Labat. It was customary to deposit mortuary offerings in the graves, which accounts for the pottery and other objects found by the author in the Balliceaux cemetery. The middens are commonly composed of thin layers of ashes with charcoal in which are scattered shells of mollusks, clams, pottery fragments, broken stone implements, and other objects of stone, shell or bone. These refuse heaps have shells scattered through them, but shells predominate only when the people who constructed them used mollusks for food, true shell heaps being composed almost entirely of shells, although containing rejects, as abandoned implements or utensils.

The author found a few true shell heaps in the Lesser Antilles,

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[14] After the Carib war in St. Vincent, the Black Caribs were first removed to this island and later transported to Roatan, off the north coast of Honduras.

but one at Erin Bay (near where Columbus landed) in Trinidad was large and yielded many objects similar, with the exception of the pottery, to those found in South America.

On a mound situated on a marl hill, supposed to be the site of a former village in the northern part of Barbados, there were broken fragments of pottery, and very little else, most of the mound, which was formerly a midden, having been largely washed away.

Artefacts. Artefacts, from the West Indian islands visited by the author, consist of stone implements, pottery, carved shell and bone and other objects. They have a marked difference, especially the stone implements, in different areas or groups of islands. There is not only a difference in the stone of which the implements are made, but also variations in their forms. This localization of stone implements was noticed especially in St. Vincent, St. Kitts, and Santa Cruz. Certain forms of implements, as the almond-shaped celts, are found throughout the whole extent of the Greater Antilles, Porto Rico, Haiti, and Eastern Cuba, where they constitute 90 per cent. of all the stone objects. These petaloid and almond-shaped stone implements occur almost universally in the Lesser Antilles from Santa Cruz to St. Vincent, becoming less abundant on the southern islands, where the proportion has dwindled to 10 per cent. or less. Here, on the other hand, the proportion of axes with blunt or winged heads, a form not occurring in the northern region, has increased to 90 per cent. of all the stone implements.

Pottery with handles in the form of bizarre heads occur from Porto Rico to Trinidad, appearing universally in all the islands.[15] The pottery found in each group of islands is distinctive; that from Porto Rico, for example, differs from that of the volcanic islands, and the St. Kitts style is unlike that from Trinidad, the Grenadines or Barbados.

Pottery and basket making as now practiced by the natives of several of the Antilles are lineal descendants of Indian arts and often Indian names are retained by modern potters. At present the potter's wheel is not used and pottery is baked by modern natives in much the same way as by the Indians, several centuries ago. Wherever the clay is suitable, the potter's art is still practiced and fair products are now sold generally in some corners of the open market places. Not only has the art of pottery-making been transmitted by the aborigines but also prehistoric forms and decorations

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15 At Nevis, for instance, the aboriginal styles and ornamentation are still preserved by the present natives.

have been preserved. Although the character of pottery and its decorations vary somewhat from island to island,[16] our collections are not as yet ample to differentiate one from another. We find the prevailing colors are red and white and sometimes brown, but a glazed fragment has yet to be seen. The decorations are generally incised or in high relief.

The so-called "monkey" goblet, or vase with a tubular snout appended to one side, is a good example of a form lineally descended from an aboriginal pattern. Several prehistoric specimens of these, somewhat modified, are known from collections made in Barbados and St. Kitts. The handles are somewhat differently arranged from those on typically modern monkey vases, but the essential snout, resembling that of a modern teapot, is always present.[17] The human face, heads of birds, and reptiles, especially the turtle,[18] are constantly represented on handles and effigy vases from the Little Antilles.

A study of types of implements, stone or shell, and the variations in form and decoration of pottery have led the author to classify the aboriginal cultures of the Lesser Antilles as follows:

1. Barbados is culturally as well as geologically and, in a manner, biologically a distinct archeological culture area.
2. Prehistoric objects from Trinidad and Tobago archeologically resemble those from the north coast of South America.
3. The archeological objects from the volcanic islands from Grenada to the Anegada passage are divided into two groups, one of which is illustrated by the beautiful collection from St. Kitts, made by Mr. Connell; the other by numerous objects from St. Vincent. These indicate two cultural areas in this geographical area.
4. Santa Cruz and St. Thomas have cultural resemblances in their antiquities to the Porto Rican or Jamaican area.[19]

Carib Culture. The materials indicating the so-called Carib culture cannot be distinguished from those of the agricultural people of the volcanic islands of the Lesser Antilles, although their mentality is characteristic. The Caribs are regarded by the author as having originated from a preexisting agricultural people, who lived much the same as the agriculturalists from which they sprang; but

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16 Bowls, vases and jars from Trinidad and the Grenadines have a raised base or appended ring which do not occur in the northern islands.

17 The author obtained from the natives of Nevis, who are fairly good potters and expose their wares for sale on the quay at St. Kitts on market days, a "monkey" vase almost identical with the aboriginal. The saucer of this vase, like the aboriginal, is ornamented with finger tips and both pieces closely resemble pottery found in middens of St. Kitts.

18 The frequency with which turtles and their heads occur on ancient pottery handles and effigy bowls suggests that this animal was widely worshipped, as it naturally would be, being a common food of the aboriginal people.

19 A close comparison of these areas can be shown only by technical descriptions and figures which are not practicable in this article.

they were great warriors and were hostile to their ancestors. Archeologically the objects belonging to them are not characteristic of Caribs as such, although each group of islands has a distinctive form of implement and characteristic pottery. Sir Everard F. im Thurn, relying in part on traditions to that effect, derives the Guiana Caribs from the insular. The South American Arawaks, he says, speak of incursions of Caribs from the islands, not from up the Orinoco River. According to Brett, the Warrau maiden, Korotona, gave birth to a being of human serpent form, who afterwards became the first Carib, thus making the Caribs descended from the Warrau. There is a tradition among the Arawak that the Carib tribe in former ages lived in the island to the north (Lesser Antilles).

Effect of Environment on Culture in the Lesser Antilles. The culture of man in the Lesser Antilles follows a general law and is largely the result of two causes, heredity and environment. Certain fundamental traits of culture that have possibly originated under other conditions have been modified or completely changed by the necessity of early ancestral colonists conforming to a new environment; others have not been changed owing to conservative tendencies and have remained more like those from which the race sprang. Among the latter traits may be mentioned languages, mythologies, and especially anatomical features. Among the mutable characters are those productions ordinarily indicated by the material culture. Roughly speaking, the volcanic islands were inhabited by Caribs, and, as these volcanoes were frequently in a state of activity, they were a constant menace and profoundly affected the culture of these people, often driving them to make inroads on islanders who were agriculturalists and had their homes on more stable islands. We know that, when circumstances or sociologic conditions change, insular men are driven to migrate from their homes into new lands beyond the seas and that these emigrants are naturally attracted to places where their former environment is most closely reproduced. This is one reason why there is a close relation between geographic environment, fauna, and flora of islands and human cultures. The migration of man is partly governed by the same laws as those governing animals and plants; but in casting about for a home, migratory man chooses, as far as possible, a habitat like that he has left; migrating animals and plants have not the choice, but they naturally survive under conditions like those they left in preference to new conditions to which they are not acclimated. It takes a long time and means changes amounting to specific differences, for a plant or animal to become acclimated, but man can

change his culture to meet the requirements of a new environment, although it also takes a long time for him to develop such cultural differences. Hence the difference in artefacts found in different islands of the Lesser Antilles indicates a long continued residence.

The stability of a non-volcanic island is conducive to a peaceful agricultural life rather than warlike mental tendencies. Under these conditions man has no incentive to raid his neighbor; but a volcanic island, with an eruption every three or four generations, develops and fosters the marauding spirit. As long as there was an incentive in physical conditions, due to volcanism, the inhabitants kept up warlike habits and marauding tendencies persisted.

Hurricanes, as well as volcanic disturbances, have often driven the so-called Caribs to raid other islands for food. Iñigo (p. 120), in giving the results of the hurricane in Porto Rico in 1530, ascribes the failure of food in that year as the cause of a raid on Porto Rico of the Dominica Caribs under Jaurebo; and there is every reason to suppose that frequent raids took place in prehistoric times for the same reason that Jaurebo made this incursion.

A study of the Antillean culture shows that some of these islands have changed their physical conditions,[20] while inhabited by man, to such an extent as to affect the food supply at times and this economic change has led to migrations and consequent modifications in culture. A small island will support a population up to a certain number, but when that population increases beyond a limit several things may occur. First, the inhabitants may invent a new method of increasing the food supply that the island yields, or, second, a migration of the surplus population to other islands may take place, either in the form of colonization or predatory expeditions. The so-called "Carib islands" are as a rule volcanic, and these volcanoes have been so often active that their frequent eruptions became a menace to agriculturalists. Each eruption not only killed many natives but also, by covering the fields with ashes and lava, destroyed the food supply of many others. At the time of such a calamity the survivors were naturally forced to obtain a food supply elsewhere, which led them to raid the neighboring islands. Continued catastrophes, from generation to generation, may even have permanently modified the mentality of the inhabitants of volcanic islands, affording an instructive example of the psychic influence of environment. When a renegade band had overcome the inhabitants of one of the islands it obtained a footing

[20] The eruption of the Souffriere in St. Vincent in 1903 devastated the whole "Carib community" and almost blotted out the race in that island.

from which to make excursions to others, for plunder. As some of the smaller of these islands seemed to be depopulated by men, who were really absent on distant marauding excursions, it is natural to say, as some of the early explorers did, that they were inhabited by women only.

The agricultural people of the islands are probably those of whom Davies writes: "These Arouages then are the people whom our Islanders (Dominica Caribs?) go and find out in their own country, commonly twice a year, to be revenged on them as much as they can. And it is to be observed on the other side, that the Arouages never make any attempt on the Caribees of the Islands, in the islands where they live, but only stand on the defensive; whereas they are sure to have our savages among them oftener than they wish, coasting along, as they are wont to do, all the other islands wherein they have Gardens, or Colonies, though the furthermost of the Caribby islands, which is Santa Cruz, is distant from the Country [21] of the Arouages about three hundred leagues."

The so-called insular and continental Caribs of South America are said to have linguistic similarities, but this likeness does not prove that the two have a close consanguinity. All depends on the relationship of the mothers or the women whom the Caribs in the two regions married and by whom they had children. We hear very little of them except that they spoke a different language from their lords and the probability is that they never spoke Carib. If so, their children are not Caribs but products of another stock. Marriage outside the race early gave rise to the union of African slaves wrecked on the island Bequia, and the yellow "Caribs" of St. Vincent. Although the inhabitants of Guadeloupe, Dominica, Martinique, and St. Vincent are preeminently called insular Caribs, they cannot be the same racially as the Caribs of the Orinoco, but both may be a modified type of mixed character, one of which was peculiar to the islands where they were evolved; the other to South America, but belonging to a related linguistic stock.

Man does not, as a rule, migrate from a home in which he has become acclimated simply for a change, but is generally driven by scarcity of food to seek a home where conditions are like those which he has left. This food quest and the desire to better their condition are the most potent causes that have impelled men to migrate.

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21 The country of the Arawak here referred to may be Cuba, Porto Rico, Haiti, or South America.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

Gift of Dutch Charts for the Society's Map Collection. The Hydrographic Office of Holland recently presented the Society with a complete set of its charts. The main value of this collection lies in the original data it contains on the coasts of the islands belonging to Holland in Asia and Australasia. The charts consist of recent editions with corrections recorded and constitute a valuable addition to the source material available for the Society's work.

NORTH AMERICA

A Survey of the Vegetation of New York. The New York State College of Forestry, for two years, has been doing educational work in forestry throughout the State. It has also been carrying on, at the State Forest Experiment Station, Syracuse and at other points, an investigation of forest conditions and problems connected with their development, protection from diseases and insects, and proper management. As extension work in agriculture is based entirely upon what is being accomplished in the agricultural experimental stations of the country, so too must further extension work be based upon such work as is being done in the State Forest Experiment Station at Syracuse and upon investigations of forestry problems in other parts of the State.

In the investigation of the wood-using industries of New York, carried on by the United States Forest Service and The New York State College of Forestry, it was seen, on every hand, that there is great need of a broader reconnaissance survey of the forests of the State. Such a survey of the plant life of the State will furnish a back-ground and a basis upon which the progress of research will stand out in clear proportions. Such surveys of life conditions, within a limited area or within a State, have come to be regarded as essential in working out any policy of conservation of natural resources. The National Conservation Congress has advocated the extension of biological surveys in connection with conservation programs in the several States.

It is recognized by foresters that the native vegetation of a region furnishes the only sound index as to its cultural possibilities; this is true whether it is in the raising of forests or the cultivation of other crops and this basic idea is a strong additional reason for such a plant survey of the State of New York.

This State presents many exceedingly interesting and diverse features in its physiography and surface covering and equally diverse aspects of vegetation. So far, no comprehensive analysis of these vegetation types has been made, neither has there been any general mapping of their extent or description of them. The general survey to be undertaken by The New York State College of Forestry will define these different aspects of vegetation and show their connection with surface and soil conditions. From such a survey it will be possible to develop the history of plant societies and their relation to commercial forest development; and all this will define, as nothing else can do, the position of New York State in relation to the large vegetation zones to the north, the south and west.

The reconnaissance survey of the plant life of this State is now being carried on by Dr. William L. Bray, who began the work last spring. Dr. Bray is in charge of botanical instruction in both the University and the State College of Forestry, and, as he has a leave of absence for a year, he is spending this year in a line of work which he pursued with distinction in the southwest, in his studies of the vegetation of Texas, published in a series of bulletins by the United States Forest Service and the University of Texas.

Information on National Parks. A set of useful circulars containing general information on National Parks is issued each season by the Department of the Interior. These publications contain valuable suggestions regarding convenient routes to these reservations as well as concise descriptions of the grounds and features of interest. Hotel, camp and transportation rates are given, and distances to principal points shown in tabulated form. A list of books and magazine articles relating to the parks is inserted in each pamphlet. Regulations governing conditions under which residence and travel in the parks are allowed are also provided. A separate circular is issued for the Glacier, Yellowstone, Crater Lake, Yosemite, Mesa Verde, Mount Rainer and the Sequoia and General Grant National Parks. These publications may be obtained free by written request to the Secretary of the Interior or by personal application to the office of the Superintendent of the Park.

The Glacial Great Lakes. The advance publication of a chapter from a U. S. Geological Survey monograph gives the latest information regarding the glacial Great Lakes (F. B. Taylor. The Glacial and Postglacial Lakes of the Great Lakes Region. From the Smithsonian Report for 1912, Washington, 1913, pp. 291-327). Taylor says the stream-carved valleys of the great lakes were not occupied by lakes before the glacial period. His brief outline of the history of the Great Lakes differs notably from that which he presented over seventeen years ago (Studies in Indiana Geography. Terre Haute, 1897). This progress is due especially to Taylor's own work, Goldthwait's precise levelling, and the work of Leverett, Alden, and others in tracing the moraines in their relation to the levels of abandoned beaches.

Six of the salient stages of lake development, illustrated by excellent maps, are: (a) The first small lakes—Lake Chicago in the Michigan basin and Lakes Maumee and Saginaw in the Erie and Huron basins with independent Wabash and Illinois River outlets; (b) The Lake Whittlesey stage, with outlet into Lakes Saginaw and Chicago; (c) enlargement of the above to the Lake Warren stage (Chicago outlet) marks the inclusion of the Finger Lakes of New York, which were previously drained by the Susquehanna; (d) The Lake Duluth, Lake Chicago, and Lake Lundy stage includes some new features, for while the Duluth and Chicago outlets were independent, Lake Lundy (including Lakes Dana and Elkton) had shifted the waters of Lake Warren from their westward course by the Grand outlet into Lake Chicago to an eastward course by the Syracuse outlet to the Hudson. (e) Lake Algonquin had two outlets during parts of its history, southward past Chicago and southeastward by the Kirkfield outlet into Lake Iroquois and then, by the Mohawk outlet, to the Hudson-Champlain estuary. (f) The Nipissing Great Lakes, with the Ottawa outlet, seem to have been coexistent with predecessors of Lakes Erie and Ontario which had begun to use the St. Lawrence outlet.

This summary fails to present half the complicated condition of our present knowledge as outlined by Taylor. Lake Algonquin, for example, had four important stages and the Nipissing Lakes at least two, in each case with shifting outlets. The use of the Niagara gorge as a measure of post-glacial time is practically upset by Taylor's positive statement that the Niagara River has been twice robbed of the waters of the three upper Great Lakes, of course for unknown lengths of time.

The student of glacial geology will find many new points in the discussion, for the discovery of the hinge lines and the working out of isobases for various stages of the several lakes has introduced many complications in the history, which Taylor handles in masterly fashion. The early part of the history of Lake Duluth and of possible relations of Lake Agassiz have not yet been settled. The lack of knowledge of the moraines north of Lake Superior in Canada leaves the possible complication of a detached ice block there to be explained or eliminated. The complication of postglacial marine waters in the Ottawa, St. Lawrence-Ontario basins is less troublesome.

Taylor's closing suggestion is of much interest in connection with certain of the views of Suess. "The preponderance of present evidence appears to be only slightly in favor of resilience following depression by the ice weight as the main cause of the uplifting of the land and the deformation of the shore

lines in the region of the Great Lakes. Standing as a close second to the hypothesis of ice weight is the possibility of deformation of the beaches by uplifts of the land incident to crustal creeping movements, which are simply the most recent impulses in a long process of continental growth reaching back into the Tertiary age. If certain evidences which are now supposed to indicate relatively recent crustal creep toward the southwest are substantiated, the hypothesis of resilience following depression by ice weight seems likely to become of secondary importance.'' LAWRENCE MARTIN.

State Railroad Maps of the United States. State railroad maps are generally published by state railroad commissions. The following table compiled by Leon Dominian and published in the issue of the *Railway Age Gazette* (Jan. 16, 1914), shows which of the states of the union have issued railroad maps:[1]

STATE	PUBLISHER	PLACE OF PUBLICATION	DATE OF LATEST EDITION	SCALE OF 1 IN. TO—
Connecticut[2]	Connecticut Railroad Commissioners	Hartford	1912	6 miles
Florida	Department of Agriculture	Tallahassee	1912	10 miles
Georgia	Georgia Railroad Commission	Atlanta	1911	13 miles
Illinois	Illinois Railroad and Warehouse Commission	Springfield	1913	8 miles
Indiana	Railroad Commission of Indiana	Indianapolis	0–0–0	0–0–0
Iowa	Iowa Board of Railroad Commissioners	Des Moines	1910	8 miles
Kansas	Public Utilities Commission	Topeka	0–0–0	0–0–0
Kentucky	Kentucky Railroad Commission	Frankfort	1910–14	7.2 miles
Louisiana	Railroad Commission of Louisiana	Baton Rouge	1914	8 miles
Maine	Maine Railroad Commissioners	Augusta	1913	8 miles
Massachusetts[3]	Massachusetts Board of Railroad Commiss'rs	Boston	1913	7 miles
Michigan	Michigan Railroad Commission	Lansing	1906	?
Minnesota	Minnesota Railroad & Warehouse Commiss'n	St. Paul	1913	10 miles
Mississippi	Mississippi Railroad Commission	Jackson	1911	13.3 miles
Missouri	Missouri Railroad & Warehouse Commission	Jefferson City	0–0–0	0–0–0
Montana	Montana Railroad Commission	Helena	1913	12 miles
Nebraska	Nebraska State Railway Commission	Lincoln	1911	10 miles
Nevada	Railroad Commission of Nevada	Carson City	1911	15.5 miles
New Hampshire	Public Service Commission of New Hampshire	Concord	1906	11.5 miles
New Jersey	New Jersey Board of Pub. Utility Commiss'rs	Trenton	1912	7 miles
New York	New York Public Service Commission	Albany	1912	7.5 miles
North Dakota	North Dakota Commissioners of Railroads	Bismarck	1913	6 miles
Ohio	Department of State	Columbus	1912	?
Oklahoma	Oklahoma Corporation Commission	Oklahoma City	1913	10 miles
Pennsylvania[4]	Pennsylvania State Railroad Commission	Harrisburg	1912	6 miles
Rhode Island	Public Utilities Commission	Providence	1914	1.25 miles
South Carolina	Railroad Commission of South Carolina	Columbia	1912	15 miles
South Dakota	South Dakota Railroad Commissioners	Pierre	1910	12 miles
Tennessee	Tennessee Railroad Commissioners	Nashville	1906	12 miles
Texas	Texas Railroad Commission	Austin	1913	18 miles
Vermont	Pub. Serv. Commis. of the State of Vermont	Newport	1912	4 miles
Washington	Public Service Commission of Washington	Olympia	1911	8 miles
Wisconsin	Railroad Commission of Wisconsin	Madison	1912	10 miles

In addition to these railroad maps, U. S. Geological Survey state maps on a scale of 1:500,000 are now available for the states of Alabama, Arkansas and Delaware. These sheets show the lines constructed. An excellent topographic map of Colorado showing railroads in operation and proposed was issued in 1913 by the State Geological Survey. This map is on a scale of 1:500,000 and is based on one of the still unpublished state maps compiled by the U. S. Geological Survey.

[1] A railroad map of the Territory of Alaska will be found accompanying the report of the Alaska Railroad Commission published as House Document No. 1346, 1913, Government Printing Office, Washington, D. C.

[2] A separate map of the street railways of Connecticut is also published on a scale of 1 in. = 3.2 miles, by the same commission.

[3] A map of the street railways of Massachusetts is also published on a scale of 1 in. = 4 miles, by the same commission.

[4] Two maps are published by this commission: (a) steam railroads and (b) electric railways.
0-0-0 These states have not published any railroad maps in recent years.

Exhibition of Mexican Coinage and Medals. The Constitutionalist forces in Mexico have coined money in silver and copper. These coins were struck at Parral, Chihuahua, and are very crudely done; in fact they are about the crudest coins that have been made in many years. Three of them have recently been brought to New York, and are now on exhibition in the Museum of The American Numismatic Society, Broadway, at 156th Street. The Peso dollar has on one side simply "H DEL PARRAL 1913" in a wreath, and on the other side "1 Peso."

The Half Dollar is more pretentious though very crude. On one side is the inscription, "Fuerzas Constitucionalistas 1913" (Constitutional Forces), and, in the center, a liberty cap surrounded by rays, a copy of the older style of Mexican coins. The reverse has "50 Centavos" in a wreath, a poor copy of the coinage of Huerta. A specimen of this latter, dated 1913, is also shown. The copper piece, which is said to have been made from copper trolley wire melted down, is similar to the 50 Centavos, but has "2 C" in a wreath for 2 Centavos.

Appreciating the general interest in Mexican affairs, the American Numismatic Society has had on exhibition for some months, a collection of Mexican coins, medals, and decorations. These begin with Mexico under Spain; and the first coins were the earliest money coined in America, during the reign of Charles and Johanna in 1516-1520. Various coins of Spanish rulers are also shown. During the reign of Ferdinand VII the various possessions in the New World began to throw off the Spanish yoke, and an interesting series of crude necessity coins are shown. These were struck by both factions. The Central Junta, in behalf of the monarchy, struck money in Mexico City, Durango, Zacatecas, Chihuahua. Money was also struck in the field by Gen. Vargas, at Sombrerete, and by the Revolutionary army of the South under the patriot Morelos in 1811-1814.

Another leader, in 1821, Gen. Iturbide, succeeded in making Mexico independent, and the next coinage was of this man as Emperor under the name of Augustin. On the abdication of Augustin, in 1823, begins the Republican coinage which has continued to the present time except during the days of the ill-fated Empire under Maximilian, 1864-1867, when a series bearing this unfortunate man's head was produced.

Various medals, orders and decorations issued by the Mexican Government are also shown. Our war with Mexico, in 1845-1848, is illustrated by several medals awarded by the Government to Generals Scott and Taylor and by a number of medals awarded by several of the States of the Union to different officers and soldiers. Besides these are shown a number of badges worn by members of organizations of Mexican War Veterans.

The Southern Geographic Society. This Society has recently been established at Knoxville, Tenn. Its President is Charles H. Gordon, Professor of Geology at the University of Tennessee; Recording Secretary, E. E. Patton, instructor in Commercial Geography, Knoxville High School. The Society's aims are: (1) To encourage inquiry and research into subjects of geographical interest; (2) To encourage geographical instruction in the universities, colleges and schools of the South, and to assist in building up in Knoxville, and elsewhere in the South, collections, in libraries and museums, of books and pamphlets, maps and atlases, photographs and other illustrative material bearing on geography; (3) To promote the exploration of unknown or little known regions and to publish or aid in publishing the results; (4) To organize and conduct geographical excursions, and to conduct, in connection with the Summer School of the South, a field school of geography. Monthly meetings will be held from October to May, inclusive, at which addresses or lectures will be given. From time to time, excursions will be conducted by the Society. Beginning with next summer, it is proposed to conduct in the mountains, for four or six weeks, a camp school for the study of geography and related subjects, including plants, animals, physiography, geology, forestry, etc. Excursions will be made under competent instructors for the study of the flora, the fauna and the physical features of the region.

The late Professor Tarr's Posthumous Works. The Macmillan Company is just publishing "College Physiography," by Ralph S. Tarr, late

professor of Physical Geography in Cornell University. The book was practically completed by the author before his death in 1912. It has been edited by Dr. Lawrence Martin, Associate Professor of Physiography and Geography, University of Wisconsin, who has illustrated it and prepared it for publication in accordance with the plans of Professor Tarr. The book has been awaited with much interest, as the author's high qualifications for writing it, it was believed, would result in a text of exceptional value for use in the higher schools and in libraries.

The National Geographic Society announces the publication of "Alaskan Glacier Studies" by Profs. Tarr and Martin, based upon field work in 1909-1911 and 1913. Both these books will soon be reviewed in the *Bulletin*.

Geographical Lectures at the Summer Session of Columbia University. These lectures were delivered under the auspices of the Department of Geography:

July 20, "Climatic Changes and their Geographic Effects." Illustrated. Professor Ellsworth Huntington, Yale University.

July 29, "The Motions of our Earth, demonstrated with the Foucault Pendulum and experiments with Rotating Bodies. Professor Harold Jacoby, Columbia University.

August 5, "The Scenery of American Rivers." Illustrated by colored lantern views. Professor Douglas W. Johnson, Columbia University.

August 12, "Ancient Sea Margins in the Hudson and Connecticut Valleys." Illustrated. Professor Herman Le Roy Fairchild, University of Rochester.

Explorations and Surveys in Canada. Mr. R. W. Brock, Director of the Geological Survey of Canada, informs the Society that the Geological Survey has sent out an expedition to the Athabasca Lake District in charge of Mr. Charles Camsell of the Survey. Mr. Camsell will explore the country between Black Bay, Lake Athabasca, to Christie Bay, Great Slave Lake, between the Great Slave River and Dubawnt River, filling in as much as he can of this blank in the map of Canada. A biologist, sent out by the Biological Division, accompanies him to make notes on and collections of the flora and fauna of the region traversed. Mr. F. J. Alcock will study the geology of the north shore of Lake Athabasca and Mr. A. G. Haultain, topographer, will make a survey of Lake Athabasca, on a scale of four miles to an inch, to be used as the hub control for all exploratory surveys in the surrounding country. An ethnologist, sent out by the Anthropological Division of the Survey, accompanies the Lake Athabasca party.

Other work arranged for is the topographical mapping of the Chilkat map area, extending from the British Columbia-Alaska boundary line district parallel to the Chilkat River. The map area is 1,000 square miles and will be mapped on a scale of four miles to an inch, with 250 feet contours. Mr. W. E. Lawson is the topographer in charge.

Mr. F. S. Falconer, topographer, is surveying the Jordan River sheet on the same scale. This map area is 1,500 square miles and lies between 118° and 119° W. and 51° and 51° 30″ N., and includes the portion of the Columbia River Valley between Revelstoke and Carney. This map sheet should be interesting to geographers in connection with the subdivision of the mountain systems of the Canadian Cordillera.

Mr. A. C. T. Sheppard, topographer, is completing the Flathead sheet along the Continental Divide just north of the International Boundary line; and is also beginning a new standard sheet in the Crows Nest area, on a scale of four miles to an inch, with contours of 200 feet. This sheet lies between 114° and 115° N., and 49°30″ and 50° N.

Mr. E. L. Bruce is making an exploratory survey, with special reference to geology, of the country north of the Pre-Cambrian—Ordovician boundary east of Sturgeon Weir river, south of 55° N., and east of the Hudson Bay R.R.; and Mr. D. D. Cairnes is making a general reconnaissance of a belt between Dalton Post and Canyon City, including the eastern edge of St. Elias Range, Yukon Territory.

"Colds" and Weather Conditions. Our common colds are little understood. The name suggests the popular belief in the relation of this disability to low temperatures, draughts of air, and general chilling. Dr. C. M. Richter, of San Francisco, has made a study of "Colds and their Relation to the Physics of the Atmosphere" (*Med. Record,* Dec. 6, 1913). The conclusions reached, from meteorological and physiological points of view, seem reasonable. Dr. Richter believes that colds depend primarily on an excess of moisture in the air we inhale. This excess is found principally during cyclonic weather, especially when a period of very dry weather has preceded. The excessive nasal secretion relieves the respiratory apparatus from the otherwise damaging effect of an overcharge of moisture, and is analogous to the profuse perspiration of the outer skin which takes place under certain conditions of temperature and humidity, forcing better conditions for evaporation. Latent microbism becomes active on the mucous membrane after these air conditions have, for some time, favored its development. Microbism, in the author's opinion, is very rarely the primary cause of an acute cold. R. DEC. WARD.

AFRICA

A Geographical Result of the Nigeria-Kamerun Boundary Demarcation. Captain W. V. Nugent, describing the geographical results of the Nigeria-Kamerun Boundary Demarcation Commission, 1912-13, says: "It is worthy of note that the Benue itself, as well as its three great southern tributaries, all of which rise on the plateaus of the central Kamerun, only become navigable for canoes near the points at which they cross the boundary into Nigeria. These limits of navigation have naturally had an important effect on the distribution of man over the country—the more civilized peoples inhabiting the plains, where trade routes are numerous and easy, while the savage pagan tribes, who care nothing for trade and only want to be let alone, have withdrawn to the almost inaccessible hilltops. It has yet to be proved, however, that the inhospitable Kamerun mountains do not contain a far greater source of wealth, in the shape of undeveloped minerals, than the wide, cultivated plains of Northern Nigeria."

EUROPE

The Nineteenth Congress of German Geographers. The nineteenth Congress of German Geographers, which meets every two years, was called to order by Prof. Dr. H. Wagner (Göttingen), in the auditorium of the University of Strassburg on June 2nd. Words of welcome were expressed by representatives from various local committees and associations after which Prof. A. P. Brigham, President of the Association of American Geographers, extended the good wishes and sympathetic interest of both its members and of American geographers in general. On behalf of the German geographers, Dr. Wagner expressed the hope that international cooperation among the countries on both sides of the Atlantic might continue to be stimulated.

The programme (June 2-7 inclusive) was divided into three main parts: 1. The reading of papers; 2. An exhibition of ancient and modern maps of Alsace-Lorraine, of instruments and maps used or produced by the Prussian Land Survey, and of a series of maps prepared by Dr. Spahn, illustrative of the development of German newspapers in relation to the progress of transportation facilities from 1600 to 1900; 3. Excursions.

The papers were included under the following topics: 1. Results of Recent Exploration; 2. Geographic Instruction; 3. Earthquakes; 4. Geography of Alsace-Lorraine; 5. Migration of Various Tribes. Although none of the papers presented notably new thought, many of them were of a high order of interest. To mention a few titles, Dr. Filchner (Berlin) and Dr. Heim (Munich) gave illustrated accounts of their expedition to the Antarctic Dr. F. Thorbecke (Heidelberg) discussed the geographic work done in connection with exploration in Central Kamerun from 1911-1913. In talks by Dr. Langenbeck, Dr. Krause and Dr. Wolfram all of Strassburg, the geology and geography of Alsace-Lorraine were made clear.

It is perhaps noteworthy in the annals of the German Geographers that no little attention was given to the place of women in the educational field. Prof. H. Fischer (Berlin) presented a paper entitled "Erdkunde (Geography) in Schools for Girls." He concluded, among other things, that since the girls represented the mothers of the future, such geography should be taught them as would develop patriotism and stimulate a keen interest in their country. They would thereby become better equipped to teach their children love for the Fatherland and so aid in strengthening the nation.

The Gesellschaft für Erdkunde und Kolonialwesen in Strassburg presented a memorial to the members in the form of its *Mitteilungen* for 1913. It contained four papers as follows:

1. The origin of the middle-Rhine Valley and middle-Rhine Mountains—Dr. L. van Werveke. 2. Orographic-geologic and tectonic review of the vicinity between Rimbach and Lebertal—Dr. Hans Klähn. 3. The Colony, German New Guinea at present—Dr. Karl Sapper. 4. The development of the Cartography of Alsace, from its beginning to the Cassinian map—Karl Schott.

There were three one-day and three two-day excursions to various parts of the Vosges and to Lorraine, besides half-day excursions to more local points. They were all very well attended. These excursions occurred on the last two days, thereby avoiding conflict with the reading of the papers.

The city of Strassburg showed its generosity, as well as its desire that the geographers be well entertained, by presenting a most attractive and delightful song playlet, (Goethe's) "Die Fischerin." This was given upon a lagoon in the Orangerie. Upon another evening a military band played in the large square (Kleber Platz) in front of hotel headquarters.

The registered attendance was 356 which measures well up to that at previous meetings. American Geographers, particularly those who took part in the Trans-Continental Excursion of 1912, may be interested in reading the names of some of those who attended the congress: Oberhummer (Vienna), von Zahn (Jena), Nussbaum (Bern), Drygalski (Munich), Uhlig (Tübingen); further there were Friederichson (Greifswald), Hahn (Königsberg), Hassert (Cöln), Koch-Grünberg (Freiburg), Mecking (Kiel), Meinardus (Münster), Philippson (Bonn), Sapper (Strassburg).

It was decided to hold the twentieth meeting in Leipzig in 1916.

Map Exhibition Illustrating Economic Geography. A feature of the Eighth Italian Geographical Congress, held at Bari, Italy, in September, is an exhibition of economic maps from the leading countries, giving a comprehensive, cartographic view of their agriculture, industries and communications. The agricultural division is shown in nine sections, including botanical, meteorological, irrigation, crop, and stock-raising maps and maps of agrarian zones, agricultural industries, etc. The division of industries includes geologico-mining maps, maps of fisheries, maps showing the distribution of each manufacturing industry, industrial districts and zones, distribution of motive power and of working population, etc. The division of communications is shown in twelve sections, including maps of maritime, river and rail transportation, plans of ports and maps of their hinterland, postal, telegraph, and colonization maps, etc. Special attention is given to educational maps and texts on the subject.

The International Congress of Ethnology and Ethnography. This Congress, held at Neuchâtel, Switzerland, in June, anouncement of which was made in the March *Bulletin* (p. 207), brought several papers of geographical interest. Dr. Edward Hahn, whose suggestive work "Die Haustiere und ihre Beziehungen zur Wirtschaft des Menschen" (Leipzig, 1896) is well known and whose recent paper in the *Geographische Zeitschrift* (1913, Nos. 6 and 7) on the relation of nomads to their domestic animals again recalls what fruitful fields of inquiry this relatively unworked phase of geography presents, read a paper on "The Date of the Introduction of Plow Culture into Central Europe." M. Henri Froidevaux, the librarian of the Paris Geographical Society, whose "Paris Letters" in the *Bulletin* for 1900 to 1904, will be remembered, spoke on the travels in northern India of Lars de Lauriston, a forgotten explorer-adventurer of the eighteenth century, whose accounts contain valuable

material for the study of the natives, as they had not yet, at the time of his travels, come into frequent contact with Europeans. Dr. Charles Biermann, professor of geography at the University of Lausanne, presented a paper on "Geographical Environment and Race Traits" in which the geographer's consideration of environment was urged upon the ethnologist in his investigations. Dr. Karl Weule, professor of ethnology at the University of Leipzig, submitted a resolution to the congress to the effect that ethnology be recognized as a distinct science and not as a subdivision of geography. This resolution was adopted and transmitted to the nineteenth biennial congress of German geographers, whose sessions were then being held at Strassburg (*Gazette de Lausanne,* June 14, 1914).

Reform of Geographical Teaching in Hungarian High Schools.* In accordance with the general wish to reform secondary school education, Béla de Jankovich, Ph.D., Secretary of the Board of Education in Budapest, has worked out a revised syllabus, which has aroused much interest in educational circles. The chief aims are to reform the teaching of geography and introduce the study into the higher grades of the eight classes of the high schools. Heretofore, geography has been taught only in three classes of the classical, and four classes of the general high schools. The method of teaching is merely descriptive with no attention to the modern, scientific, explanatory side of the study. The Secretary of the Board of Education urges that geography should be taught more fully and in more classes; and, in the higher classes, from a scientific point of view.

The method and matter to be taught is to be considered by the Reform Committees of the Hungarian Geographical Society and the General High School Teachers' Association. These committees hope to secure the introduction of geography into nearly all the classes of our High Schools.

MICHAEL HALTENBERGER, PH.D.

POLAR

ARCTIC

Going to the Relief of the Karluk's Crew. The newspapers printed a despatch from Nome, Alaska, dated July 23, saying that the revenue cutter *Bear,* with Captain Robert A. Bartlett, commander of the wrecked ship *Karluk* of the Stefansson Arctic expedition, on board, sailed on that day to rescue the crew of the lost vessel, at Wrangell Island, where Bartlett and his party took refuge after the sinking of their vessel.† Captain Bartlett was reported as saying that though the Karluk's crew would probably consume all the food they had landed on Wrangell Island by the middle of August, they should be able to subsist on the game with which the island abounds, till relief reaches them. The *Bear* carried provisions for nine months.

Another Large Meteorite Found at Melville Bay, Greenland. A letter received by President Osborn of the American Museum of Natural History, from Professor D. B. Böggild, Director of the Mineralogical Museum of the University of Copenhagen, says in part:

"Mr. Knud Rasmussen has found a large meteorite at Melville Bay, a small specimen of which he has brought home to the Mineralogical Museum of the University of Copenhagen, at whose disposal he has, at the same time, placed the large stone at present lying on the spot where it was found—a gift for which we are exceedingly grateful.

"The Crocker Land Expedition has kindly rendered Mr. Rasmussen scientific help, in this matter, by having the stone examined, after the find was made, both on the spot and in the laboratory; an examination which, through the

* Corresponding to classes 5-8 of the American grammar school and including the American high school.

† See *Bulletin*, Vol. 46, 1914, pp. 520-523.

kindness of Mr. Donald MacMillan, was carried out in a most excellent manner by Mr. W. Elmer Ekblaw, the Geologist of the Expedition.

"Mr. Ekblaw investigated the facts and submitted a very complete report which is of the greatest importance to us. We are indebted not only to the Expedition at present in Greenland but also to the Direction in America. We therefore feel it our pleasant duty to tender our best thanks to the Committee just as we have already directly thanked both Mr. MacMillan and Mr. Ekblaw."

PERSONAL

Dr. Eugen de Cholnoky, professor of Geography at the University of Kolozsvár, Hungary, was, in March, elected president of the Royal Hungarian Geographical Society, Budapest, for the term expiring in 1917. The former President, Professor Louis de Lóczy, Director of the Royal Hungarian Geological Survey and the well-known China explorer, became Honorary President.

Professor W. M. Davis wrote from Sydney, N.S.W., on June 11, that he had arrived there on the 9th, was enjoying the friendly attentions extended to him and was to sail on the next day for New Caledonia, where he was to spend the remainder of the month. He expected to be in New Hebrides in July and to return to Australia in August for the meeting of the British Association. His health had been excellent throughout his long journey and work was never more profitable.

Commander Evans, R.N., addressed the Hungarian Geographical Society, at Budapest, on Feb. 5, on "The Last Expedition of Captain Scott." After the address, Prof. Lóczy, President of the Society, presented to him the Society's gold medal. The meeting was followed by a dinner attended by many well-known people.

Dr. J. Walter Fewkes, Ethnologist of the Bureau of Ethnology, returned to Washington, late in July, from the Mimbres Valley, New Mexico, where he spent six weeks. He brought back a fine collection from that little known region.

Dr. Roland M. Harper, of the Florida State Geological Survey, is making a quantitative analysis of the vegetation of the northern half of the State, by natural divisions (about twenty in number). When the percentages are figured out, it will be possible to determine the proportion of evergreens, grasses, leguminous plants, etc., in each region, correlate them with soil, climate, etc., and draw some interesting conclusions. Beside the vegetation, Dr. Harper will discuss other geographical features, somewhat as he did in his report on the forests of Alabama last year (*Geol. Surv. Ala., Monograph 8*), but more fully if possible.

OBITUARY

Jacob Huber. Dr. Jacob Huber, Director of the Museu Goeldi (Museum of Natural History and Ethnography, Belem, Para, Brazil), died on Feb. 18, in the forty-sixth year of his age.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

THE AMERICAS

The Two Americas. By General Rafael Reyes. Translated from the Spanish, with added notes by L. Grahame. xxxii and 324 pp. Ills. F. A. Stokes Co., New York, 1914. $2.50. 9 x 6½.

This English translation of the Spanish account of the impressions of ex-President Rafael Reyes, of Colombia, during his recent tour of Spain, France, the United States, and South America, is chiefly interesting as giving a view of South America as seen by Latin-American eyes. A noteworthy feature of this record is the account of the geographical exploration of the Putumayo and other affluents of the Amazon, undertaken by President Reyes in his youth with his two brothers and continued for ten years. They navigated these tributaries of the Amazon and the Amazon itself to Brazil, returning to Colombia by steamboat along the same route. One of the brothers died of fever during this work and the other was slain by the cannibal natives of the Putumayo District, recently made notorious by the rubber atrocities. Other salient features are the Colombian version of the conduct of our country in acquiring the Panama Canal Zone, the denial of Bryce's statement that people of Negro blood predominate in Brazil, an extended account of the topography, history, culture, commerce and finance of Argentina, and the full text of the will of Bolivar. DAVID H. BUEL.

Süd- und Mittel-Amerika. Seine Bedeutung für Wirtschaft und Handel. Ein Ratgeber für Exporteure, Importeure, Ansiedler, Minen-Interessenten, Kapitalisten, usw. Von O. Preusse-Sperber. vi and 218 pp. Ills. Otto Salle, Berlin, 1913. Mk. 4. 8 x 5½.

Substantially directions for German emigrants. If you cannot get along at home, are neither too young, nor too old, nor too delicately brought up, emigrate, but *not to the United States,* where the land is too dear and worn out—200,000 farmers left it last year for Canada—and laws or lack of them would bother you, for in 1912 a man got ten lashes and a year's imprisonment in Wilmington, Del., for stealing a revolver! Moreover the immigration authorities would very likely not let you in, although perfectly well. Don't add your powers to Germany's commercial enemy, but go to South or Central America, pretty nearly an Eldorado, where you will not be asked to naturalize yourself, but may remain a German citizen, may raise raw products for Germany and import products of German factories and increase the glory of your Fatherland. But hurry, for what "Washington officially calls Dollar Diplomacy" is after Latin America! MARK JEFFERSON.

The Republics of Central and South America. Their resources, industries, sociology and future. By C. R. Enock. 544 pp. Maps, ills., index. J. M. Dent & Sons, London, 1913. 10s. 6d. 8 x 6.

This study of Latin America from an English viewpoint, differs from the usual works of travel and description dealing with the same subject, in that it aims to look at the Latin American Republics from a demographic standpoint, the economic relation of these peoples to their habitat and the natural resources which surround them. The author is of the opinion that this science of demography, which he terms "human geography" will prove the determining

factor of social equilibrium. The colored maps showing the political divisions, the population, and the economic value of these countries are of material assistance to this view. The more noteworthy chapters are those dealing with the archeological theories in regard to the prehistoric ruins of the Toltecs, and Aztecs in Mexico, and those of the Incas in Peru, the general physical and social condition of Latin America, its foreign relations and commerce, its sociology and future. DAVID H. BUEL.

ASIA

The Madras Presidency, with Mysore, Coorg and the Associated States. By E. Thurston, C.I.E., sometime superintendent of the Madras Govt. Museum. xii and 293 pp. Maps, ills., index. Provincial Geographies of India. University Press, Cambridge; G. P. Putnam's Sons, New York, 1913. $1. 8 x 5½.

This is the first to appear of a series of provincial geographies of India now in preparation. Col. Sir Thomas H. Holland, editor of the series, and author of the chapter on Geology in this volume, says in his preface to the book that among the "provinces" the Madras Presidency has above all developed an individuality of its own; that everyone who knows the Senior Presidency will recognize the pre-eminent fitness of Mr. Thurston to give a true picture of South India; and that no better recommendation of the book can be given than to say that Mr. Thurston is its author. Large attention is given to the peoples, physical geography, resources and industries of the southern part of the peninsula.

The Life and Thought of Japan. By Okakura-Yoshisaburo. viii and 150 pp. Ills., index. J. M. Dent & Sons, Ltd., London, 1913. 3s. 6d. 7½ x 5½.

The author of these seven essays, originally delivered at the Boston Athenaeum, certainly knows what he is writing about. It is a very pleasant picture of the old Japan growing into something new and at present trying to be somewhat less amorphous than the incidence of new culture necessitates. But has he succeeded in translating the thought of Japan into American thought as successfully as he has translated it into English speech? We recall the time when Japanese art was coming to us as a new discovery, very cheap in its medium, for we best knew it in daintily pictorial fans of fuzzy paper on fingers of split bamboo; but what was their appeal to our art sense? We lacked the basic principle wherewith to understand such drawing. So with this graver matter of becoming acquainted with a great community we still feel the lack of comprehension. These essays are very interesting, they will lead us some steps forward toward appreciation. But it is very hard for one culture group to come into sympathy with another culture group, and this regardless of the absolute value of the culture attainments of each. The author strives to make us feel in every one of these essays, he strives to tell those things which shall reveal to us the feeling of his countrymen in their joy of living to unregretted death; but we may not avoid the feeling that he is working in an intractable medium, that the canons of his life are yet unfamiliar to our interpretation of the duties and pleasures of such life as we know. It is saddening to find ourselves deaf to hear and unresponsive to such brilliant effort to reach our comprehension. WILLIAM CHURCHILL.

China's Revolution, 1911-1912. A Historical and Political Record of the Civil War. By Edwin J. Dingle. 303 pp. Maps, ills., index. McBride, Nast & Co., New York, 1912. $3.50, postage 20 cents.

It is yet too early to deal satisfactorily with the political elements of the ill understood complex of upheaval which has been designated the revolution in China, or the revolution of China, according as the student may prefer to interpret facts. No political movement may properly be discussed while yet the events are new. Still less is it possible to arrive at a just comprehension of Chinese politics save by rare intuition into thought methods which are

wholly diverse from those with which we are familiar. But omitting from this work all the politics as debatable, enough remains to make it of great value. Mr. Dingle knows his China well, in some regards, intimately. He has a shrewd knowledge of most of the greater figures who have come to the front in the new China and characterizes them cleverly. The difficulties he has recognized, he knew the uncertainty of rumor, the selfish interest which sought to distort the events of the busy time. Even of occurrences of which he was an eye witness he is forced to acknowledge that the interpretation is doubtful. Still the volume gives us the first clear narrative of what happened to change the empire. We have the record of dates and places of those eventful months, we obtain a glimpse of the interrelation of the commotion within the Forbidden City and the emptying of the Dragon Throne with uprisings in distant provincial centers. Knowing well the chance of error and the certainty of mendacity, he exercised great care in confirming each item of the record. Everything has been supported by the best evidence forthcoming and the proclamations and more official acts, such as the edict of abdication, are translated at length; these will prove of great advantage to the student of the history of that troublous time. WILLIAM CHURCHILL.

AUSTRALASIA AND OCEANIA

Across Australia. By B. Spencer and F. J. Gillen. Vol. 1: 254 pp. Vol. 2: pp. 255-515. Maps, ills., index. The Macmillan Co., New York, 1912. £1 1s., 2 vols. 8½ x 5½.

In these two volumes we have the day by day record of the exploration which has already found fruit in two great works. It is astounding that in the dreary traverse of the central Australian desert they should have found so much, for the miles stretch on without food and water and the only path is the hundred foot clearing through which is strung the overland telegraph from Port Augusta to Port Darwin. With hesitation they introduce a theme worthy of more courageous presentation. This is that the aboriginals of Australia are contemporaneous men of the Stone Age, palaeolithic men just beginning the advance upon neolithic culture as shown by the fact that they employ chipped and flaked stone artifacts with a few in which the stone is polished. I have already advanced the value of this recognition in the case of the neolithic man of the South Sea. Its great importance lies in the light which it may properly cast upon the culture of other men of the Stone Age whom we know only through their remains in cave and lacustrine deposits. The stone bearing the mark of human art is the only permanent memorial and from the specimen unearthed to our view we struggle to reconstruct a society. Spencer and Gillen here suggest that the chipped quartzite and the rubbed diorite are better illustration of Stone Age culture when we find them in Australian hands and have the opportunity to see how they are worked and how employed. Furthermore, our museum specimens can give us a picture of stone life and stone alone, but the Australian gives us to see how, with the stone, man had acquired the use of wood and fur and down of birds and cords of human hair to serve his daily needs and these, being perishable, have vanished from our knowledge of other Stone Age man. When we notice that the primitives of this Australian horizon have not advanced beyond two-ply twine, that pottery, braiding and weaving lie wholly outside their culture, we shall recognize what an opportunity they afford for an insight into the beginnings of other human societies so remote that we are not yet agreed as to their coliths, whether they fall within the province of ethnology or of palaeontology.

WILLIAM CHURCHILL.

The New World of the South. The Romance of Australian History. By W. H. Fitchett. viii and 428 pp. Index. C. Scribner's Sons, New York, 1913. 7½ x 5.

In the first volume of this work the author described those sea adventures, so charged with dramatic interest, that were associated with the discovery of Australia. The present volume tells of the gold discoveries, the bushrangers,

the early explorations, growth of political institutions and the birth of the Australian Commonwealth. One of the best chapters tells of the great work of Leichhardt and of the mystery of his last exploring expedition which was lost in the desert, in 1848.

Corallogene Phosphat-Inseln Austral-Oceaniens und ihre Produkte. Bearbeitet von Carl Elschner. 120 pp. Maps, ills. Max Schmidt, Lübeck, 1913. Mk. 8.75. 10 x 7.

The principal interest of this highly important monograph is that it presents a study of the phosphates of the Pacific islands carefully elaborated for the information of the agricultural chemist and with such discussion of the recent geology of these deposits as may serve as a guide for commercial exploration. Half of the volume is occupied with a study of Nauru and Paanapa, the two richest deposits now commercially exploited. We have very scant information as to these islands and this is a welcome addition. Pursuing his phosphate theme the author presents briefer records of Angaur in the Palau Group, of Makatea in the Tuamotu. He has fallen into a linguistic error when he defines Makatea as signifying "white eye" through misreading *maka* as *mata* eye; *maka* is a good Polynesian word for stone and Makatea really means "white rock," recognizable as a good descriptive name by those of us who have seen the sun light up its white cliffs. These are all islands of upheaval and the phosphate is more or less advanced in the chemical and pressure changes which make the beds a theme of geological inquiry. The islands of recent phosphate formation, to which he devotes a chapter, are the guano islands. Since the book is devoid of an index or even a table of contents it will not be amiss to present a list of these islands: Baker, Howland, Phœnix Group, Sydney, Malden, Starbuck, Christmas, Fanning, Flint, Jarvis, Browse, Lacepède, Laysan, Cornwallis, and Clipperton. Nauru is abundantly illustrated with excellent half tone plates and a well executed map contoured in tint.

WILLIAM CHURCHILL.

EUROPE

The Northmen in Britain. By E. Hull. 256 pp. Ills., index. T. Y. Crowell Co., New York, 1914 (?) $1.50. 8½ x 6½.

A good, popular account of the two great streams of northern invasion, Norse and Danish, which met and battled in the ninth, tenth and eleventh centuries, on the shores of Great Britain and Ireland where both nations took deep root, built cities and absorbed much of the commerce of the country. Norse sources are chiefly used in the narrative.

Les Pyrénées Méditerranéennes. Étude de Géographie Biologique. Par Maxmilien Sorre. 508 pp. Map. A. Colin, Paris, 1913. Fr. 12. 10 x 6½.

By the term Mediterranean Pyrenees the author designates the extreme eastern part of the Pyrenees, including the lower hills and plains on the eastern and northern slopes. The northern boundary corresponds to the, formerly political, but now only linguistic, boundary between Languedoc and Catalonia; the southern boundary is a climatic one: it is identical with that of the moist regions characterized by the deciduous forests. Although composed of a number of individual natural regions bearing very ancient names, the country as a whole may be designated as the region where Mediterranean and Pyrenean influences meet and blend. The biological purpose of the book is the description of those species which determine the individual geographical character of the country. After a study of the landscape as a whole, the different types of climate and vegetation are examined, and then the forms of life are compared with these natural conditions in order to ascertain the correlation and interdependence between them. The types of human life are also studied in their relation to the same conditions.

The combined influence of altitude and distance from the sea have pro-

duced several zones of vegetation each of which shows a more or less complete development according to the special local conditions. In the lowlands near the Mediterranean, protection against the droughts of the summer is the dominating feature. Irrigation has much altered the natural conditions. Between 700 and 1700 meters of height, rainfall is abundant and regular. As the steepness of the slopes is not always favorable for agriculture, textile industries and mining are combined with it. Still higher up, pastures predominate. In those regions where sheep and cattle raising are almost the only occupation of the people, interesting social conditions have survived, the classical example of such a survival being described in the small community of Andorra. The description alone of this little known country would repay one for the study of the book. The author further describes the changes which modern economic conditions and methods are working in the original character of the country, and places especial emphasis on the necessity that the ''biological equilibrium'' must be maintained between mountains and plains if the country is to experience a healthy development, and that development must be in harmony with geographical character. The book is well illustrated with many pictures and diagrams, and a colored map.

M. K. Genthe.

Sprachgeographische Untersuchungen über den östlichen Teil des katalanisch-languedokischen Grenzgebietes. Von Dr. Karl Salow. 307 pp. Maps. *Mitt. und Abhandl. aus dem Gebiet der roman. Philol., Seminar für roman. Sprachen und Kultur.* Beiheft 7, Jahrb. Hamburg. Wiss. Anstalten, Vol. 29, 1911. 1912. Mk. 20. 9 x 6½

The first part of the book contains philological matter; the second part, based on the special investigations of the first, attempts the solution of the problem why the linguistic boundary between French (Languedocian) and Spanish (Catalan) does not follow the Pyrenees but runs north of them, along the southern ranges of the Courbières Mts. The explanations offered are both geographical and historical. Geographically the Courbières are a rocky range poorly watered and scantily populated, and they probably stopped the progress of the Franks toward the Pyrenees. On the other hand, refugees from Spain, during the Moorish conquest, crossed the Pyrenees to seek protection in the country north of them (and may have been prevented in their turn from proceeding farther northward by the Courbières). As this hypothesis does not seem sufficiently proven to the author, he places greater emphasis on the historical causes for which he disposes of better documentary evidence. Namely, that the province of Roussillon, which corresponds approximately to the territory in question, has always been a political unit by itself. Its original inhabitants, of pre-Celtic stock, held their own so successfully during the Celtic conquest that their country struck the Romans as a province not belonging to Gaul, and they made a separate *colonia* of it. During the sixth century, the former *colonia* became a diocese by itself, and the boundaries both of the *colonia* and of the diocese correspond almost exactly to the linguistic boundary. Admitting the importance which political lines of demarcation may have in the development of languages, the geographer will notwithstanding emphasize the fact that even the Celtic occupation stopped at that mountain range, and ask the question why northern influences never succeeded in asserting themselves farther south—a question which the purely historical explanation leaves unanswered.

M. K. Genthe.

Die Niederelbe. Von Richard Linde. 4. Auflage. Land & Leute Monographien zur Erdkunde, Nr. 28. 202 pp. Maps, ills. Velhagen & Klasing, Leipzig, 1913. Mk. 4. 10 x 7.

This is an intensive study of the flood plain of the tidewater Elbe, which consists of the following belts: river, overflowed land, levee, marsh, moor, dune, and the margin of the upland *geest*. These parallel topographic belts are further diversified by transverse soil zones of marine sands, brackish water clays, and true river alluvium. The reaction of these physical features upon the life of the people constitutes the major theme.

Walled in by their dikes, the dwellers of the marsh districts have lived in marked isolation from each other and the world, with "cantonal disunion" as a result. Each little strip of marsh styles itself a "land," and is characterized by distinctive traits and institutions. The particularism is heightened by the Elbe, which has always acted as a barrier between the two sides of its flood plain.

The greatest problem of the people has been the control of the water, both river and underground. Out of the "age-long war with the never-resting foe" the dike communities have emerged as victors. In this contest has been moulded the character of the marsh farmer, distinguished by doggedness, hard sense, and independence. In these lowlands has been developed the haughtiest breed of German *bauern*, who still carry coats of arms like noblemen.

The latter part of the book considers the causes which are responsible for the great expansion of Hamburg, and those which so long retarded its growth.

On the whole the author analyzes the geographical control of racial traits and social institutions, rather than of economic activities. In this delicate task he has succeeded remarkably well. He knows his region intimately, and writes of it feelingly. He has kept a clear eye and a warm heart at his task. The work has been decorated with the Great Medal of Honor by the High Senate of Hamburg. C. O. SAUER.

Hungary's Fight for National Existence, or the History of the Great Uprising Led by Francis Rakoczi II. By Ladislas Baron Hengelmüller. xx and 342 pp. Map, index. The Macmillan Co., New York, 1913. $3.25. 9 x 6.

With the promise that in a later volume he will complete his history, the Ambassador of the Empire-Kingdom discusses one of the critical episodes in the life of the Hungarian nation. Any one who has ever felt stirred by Magyar enthusiasm and the passionate sentiment of proud nationality when the bands strike up the Rakoczi March may well feel curious to discover why so little information is available for the satisfaction of a natural desire to know something about Francis Rakoczi. They form but a small group, these national heroes; we cannot afford to be ignorant of any who have attained these laurels. This is the first work in English by means of which we could make the acquaintance of Rakoczi. Baron Hengelmüller has had access to many documents recently brought to light and has drawn therefrom a clear narrative of the Magyar struggle for national integrity down to the breaking off of the peace negotiations in 1706.

Handbook of Baltic and White Sea Loading Ports, including Denmark. Revised edit. By J. F. Myhre. 576 pp. Maps. W. Rider & Son, London, 1913. 21s. 9½ x 6½.

Covers all Baltic ports. The descriptive text is illustrated by black and white maps giving cartographic data as to harbors and coast contours.

Finlande et Finlandais. Ouvrage publié sous la direction de Werner Söderhjelm. Par E. Hornborg, E. Järnström and others. 330 pp. A. Colin, Paris, 1913. Fr. 3.50. 7½ x 5.

The unpretentious volume is supposed, as Prof. Söderhjelm modestly puts it, to give the reader "a few general notions on the different aspects of life in Finland," to serve as a means of orientation, as it were, for those interested in the recent political changes to which the country has been subjected, and to create a desire for a more thorough study of the country. To obtain this end, the efforts of a number of authors, each an authority on his subject, have been combined to write on the following topics: Geography, ethnology, history, and the parliamentary system, are described by E. Hornberg; intellectual culture and public schools, by E. Järnström; Finnish art, especially in comparison with French art, by A. Hartman; Finnish music, with a special appreciation of Jean Sibelius, by O. Andersson; Feminism in Finland, by Emma Saltzmann; Sports and hygiene, by E. Lampén; the industrial development, by

G.-R. Snellmann; Agriculture in Finland, by G. Grotenfelt. Although the book does not claim to be a scientific book in the narrower acceptance of the word, its spirit is more scientific than that of many a high-toned publication, owing to the perfect honesty and trustworthiness which characterizes every page; and there is not the slightest doubt that it will amply fulfill the above-mentioned purpose for which it was written. M. K. GENTHE.

L'Albania. Di V. Mantegazza. 276 pp. Maps, ills. Bontempelli & Invernizzi, Rome, 1912. L. 3.50. 7½ x 5.

The Albanians are described far more extensively than their country. Their known history is recalled and the race portrayed as energetic, though quite primitive. The writer appears impressed by the courage and deep-seated religious feeling of the people. He fails to call attention to the influence of the region's rugged topography, to which the isolation of the race and the character of its individuals are due. It is plain that he treads on surer ground when dealing with the international problems centering around Albania. His views, however, smack of decided partiality to Italian interpretations of the Albanian question.

A History of Greece to the Death of Alexander the Great. By J. B. Bury. xxv and 909 pp. Maps, ills., index. The Macmillan Co., New York, 1913. $2. 7½ x 5½.

The introductory chapter gives a good though brief summary of the geography of Greece. Seven maps serve well the purposes of cartographical illustration. In this second edition of Dr. Bury's History the larger part of Chapter 1 has been rewritten to conform with the recent discoveries made through the excavations of Sir Arthur Evans and other explorers. This compact, authoritative work may well be read in connection with some of the more recent writings on the physical geography of Greece by such men as A. Philippson, C. Neumann and J. Partsch.

Zustand der Atmosphäre über Europa am 6. Januar 1910. Heft 1, Synoptische Darstellungen atmosphärischer Zustände, Jahrgang, 1910; 1. Serie *Veröffentl. Geophysikal. Inst. der Univ. Leipzig*, herausgegeben von dessen Direktor V. Bjerknes. 13 map plates. 22 x 16.

The importance of the step recently taken by the University of Leipzig in calling Professor Bjerknes to a new meteorological professorship in that institution may be recognized in the prompt appearance of the first series of large synoptic charts showing the pressure distribution and air movement over Europe on the first international "term-day" of 1910. This publication is in many ways an epoch-making one for aerology and for meteorology. It is the first of a series which is to be continued in connection with the international exploration of the free air in Europe. The need of this cartographic presentation of upper air conditions has been felt ever since "sounding the ocean of air" became a serious scientific undertaking; and under the extraordinarily able direction of Professor Bjerknes, the Geophysical Institute of the University of Leipzig will, without doubt, be able to make aerological studies of the greatest value, whose practical bearings upon weather forecasting we shall in due time come to realize.

Ten charts show, for Jan. 6, 1910, the "topography" of the ten "Hauptschichten," *i. e.*, the altitude, for fifty meter intervals, of the isobaric surfaces for every 100 millibars, or for pressures of 750, 675, 600, 525, 450, 375, 300, 225, 150 and 75 mms. of pressure. There are further shown on each chart the thickness of the atmospheric stratum, for ten meter intervals, up to the next higher pressure surface. A new point about these charts is that they show the altitude of the isobaric surfaces, and not, as has been customary, the pressure distribution at definite altitudes. One reason for this change is that it greatly facilitates the numerical computations. In addition to the ten maps just referred to, the isobars and isotherms at sea level, and the sea level air

movements ("stream lines" are shown (Charts 1 and 2), as well as the "topography" of the lower level of the stratosphere.

To meteorologists the world over, and especially to all who are interested in the progress of aerology, the publication of this new atlas will mark a turning-point in the history of our knowledge of the atmosphere. The issue of similar charts, for the other international term days, is to be continued as rapidly as is practicable. There will also be published, as occasion demands, a series of discussions of the material which has already been collected and is available for study. R. DEC. WARD.

Europe and the Far East, 1506–1912. By Sir Robert K. Douglas. Revised and corrected with an additional chapter (1904-1912). By J. H. Longford. 487 pp. Map, index. G. P. Putnam's Sons, New York, 1913. $2. 7½ x 5.

For a decade this work has served as a manual of the policies of the eastern coast of Asia. In the course of the decade its accuracy has been challenged, its motive impugned as manifesting bias, but with the appearance of the authority of the University of Cambridge at its back it has become a standard. In this new edition, made necessary by the course of events in China, the moot points remain in their former statement, new disputes are added in the new chapter written by Prof. Longford for the purpose of bringing the work to date. In China he closes his record with the selection of Yuan Shi-kai as president of the republic. In Japan he records the last treaty of alliance with Great Britain and comments on the condition of the British merchants in the island empire with such criticism of the British Foreign Office as seems scarcely fitting in a historical treatise.

POLAR

ARCTIC

Danmark-Ekspeditionen til Grönlands Nordöstkyst 1906-1908 under ledelse af L. Mylius-Erichsen, vol. 1. *Meddelelser om Grönland,* vol 41, 1913. 474 pp. Maps, ills. C. A. Reitzel, Copenhagen. Kr. 12. 11 x 7.

Im Grönlandeis mit Mylius-Erichsen. Die Danmark-Expedition 1906-1908. Von Achton Friis. Translation by Friedrich Stichert. 2nd ed., xviii and 630 pp. Map, ills. Otto Spamer, Leipzig, 1913. Mk. 15. 10 x 7.

These reports are complementary to each other, the first mentioned constituting the official report upon the purposes and the achievements of the expedition, with which are included the shorter scientific reports; the other work is a popular account setting forth the human side of this great undertaking. This story of sympathetic cooperative effort made under trying conditions that developed the best and truest in a peculiarly well chosen body of men, was first published in Danish in 1909 and appeared in the first German edition in 1910.

As Amdrup says in his official account of the expedition, by it "the coping stone was laid on a work, which had engaged the unwearied attention of numerous explorers for centuries," * * "the extensive coastline of Greenland was now known in the whole of its length." The expedition began its work at Cape Bismarck in lat. 70° 1′, the farthest north attained by the Second German Expedition of 1870 under Koldewey and Payer, where winter quarters were established; and when finished, a previously unknown coast had been surveyed from this point to Cape Clarence Wyckoff in latitude 82° 57′, the most easterly point reached by Peary from the West.

After provision depots had been laid down, two great sledging expeditions were undertaken in 1907, the first under the leadership of the Commander, Mylius Erichsen, and including Lieut. Haeg-Hagen as map maker and the

Eskimo, Brönlund; and the second consisting of Lieut. J. P. Koch with the artist Bertelsen and the Greenlander Tobias Gabrielsen. Two additional supporting parties surveyed the southern and more accessible coast sections with their fringe of islands. The two main parties traveled together as far as Independence Bay where they separated, Erichsen going west to survey this great indentation and connect with Peary's positions on Navy Cliff and the shore of Heilprin Land, whereas Lieut. (now Capt.) Koch kept his course northward across the bay to connect with the most easterly point reached by the American explorer at Cape Clarence Wyckoff. The principal facts in the tragic history of the first party have been often told—how after mapping the great inlet which their surveys showed to be closed and hence a fiord, they attempted to return over the inland ice across the great peninsula of the northeast foreland and all perished, Brönlund alone with frozen feet struggling on to the depot where his body was found with Lieut. Hagen's maps and his own diary of the journey (in Greenlandic) to be recovered a year later by the second relief expedition of Koch and Gabrielsen.

Thanks to the devotion of Brönlund, the native Greenlander, the maps and sketches and the main events connected with the first sledging party of the expedition are known, even though all attempts to recover the bodies and the additional records and diaries of Erichsen and Hagen have proved futile (see review, "Lost in the Arctic," by Ejner Mikkelsen, *Bull. Amer. Geog. Soc.*, vol. 45, 1913, p. 862). The maps of Hagen show that the great peninsula separating Danmark Fiord and Independence Bay (Mylius Ericksen Land) is itself deeply bifurcated by a fiord (Hagen Fiord). Upon these manuscript maps of Lieut. Hagen the name "J. P. Koch's Bay" is given to the wide mouth of Independence Fiord, but with characteristic modesty Captain Koch has refused to allow the name to stand, and upon the published maps it appears as Wandels Hav.

Lieut. Koch's party after crossing this bay to Peary Land, arrived at Peary's Cairn on Cape Clarence Wyckoff in latitude 82° 59′, and after removing Peary's records continued northwestward along the coast and reached Cape Bridgman on May 15th. At this point the return was begun, and after many hardships was completed on June 23, after eighty-eight days of absence. It must be accounted one of the most remarkable Arctic sledge journeys over sea ice ever attempted, the distance covered being over 1,200 miles. Koch has since won greater fame by his crossing of Greenland (April 20-July 16, 1913) in company with Dr. Wegener and others.

The rescue expeditions as well as the two main sledging parties all indicate the remarkable efficiency and resourcefulness of the Greenlanders attached to the expedition. The heroic Brönlund was a man of high intelligence and considerable education. His carefully written journal, which gives us all our knowledge of the ill-fated sledging expedition after it separated from Koch's party, could not at first be fully translated by the other Greenlanders of the expedition because its academic style was somewhat beyond the simple outfit in written language which they possessed.

A peculiar interest attaches to this expedition because two competent artists (Friis and Bertelsen) accompanied it and have brought back the first extensive collection of paintings made in such low temperatures, many of which are reproduced in the popular volume. It was found that special methods had to be resorted to to keep the oil colors from freezing in temperatures as low as 40° Fahr.

In addition to Amdrup's narrative report upon the purposes and accomplished results of the expedition, the official report contains the following scientific papers: Hydrographical Observations by Alf. Trolle; Tidal Observations in Danmark Havn by H. A. Ö. Bistrup; Health Conditions, by J. Lindhard; and Mylius-Erichsen's Report on the non-existence of Peary Channel (information brought home by Ejnar Mikkelsen), by G. C. Amdrup.

Trolle's report upon the Hydrographical Observations includes a study of currents based on the movements of bottles which were set adrift from the vessel and in part afterwards recovered at different points along the Norwegian Coast; soundings and determinations of salinity, density and temperature of the water at different depths along the track of the vessel. The

bottles which were recovered indicate that the drift moves southward along but off the Greenland Coast to the latitude of Iceland, where it is deflected eastward and again northward so as to follow the trend of the Norwegian coast. The soundings supplement those made by the Duke of Orleans in the "*Belgica*" in 1905 and reveal a well developed, marginal continental shelf to Greenland with its edge some ten degrees off the coast. Unlike the continental shelves where they are well known, this shelf is marked by strong longitudinal ridges and furrows representing differences of level of as much as 200 meters and also by marked fiords which trench the shelf transversely. Its edge as shown by the soundings drops off in a cliff some 1,300 meters high with a slope of quite remarkable declivity. The reviewer would suggest that the sharpness and extent of the irregularities upon its surface and the precipitous escarpment at the margin of the continental shelf of Greenland is very likely to be ascribed to tectonic movements which are not here, as elsewhere, leveled off and reduced because the permanent pack-ice prevents the agitation of the water at any considerable depth below the surface. Somewhat similar ridges were discovered by the German Antarctic Expedition to exist beneath the pack ice of Posadowsky Bay. The observations upon temperature, density and salinity of the ocean water, form a particularly full series with interesting results too complex and elaborate to be treated within the limits of this review.
WILLIAM HERBERT HOBBS.

MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY

Geodetic Surveying and the Adjustment of Observations (Method of Least Squares). By E. L. Ingram. xx and 389 pp. Ills., index. McGraw-Hill Book Co., New York, 1911. $3. 8½ x 6½.

This book, originally written to meet the author's own class-room requirements, is not intended to be an exhaustive treatise for the professional geodesist, but rather to contain everything desirable for the student or useful to the practicing civil engineer.

The book is divided into two parts, each complete in itself; the first is a discussion of the practice of geodetic work, the second is an explanation of the mathematical theory on which the rules for adjusting observations are based. Rigorous mathematical discussions are frequently omitted in Part I. This is of advantage to the man in the field who wants results ordinarily without going back to his college mathematics. In discussing angular measurements, particular attention is given to the repeating method because of the good results obtainable with it, with the ordinary engineers' transit, the only angle-measuring instrument in the average engineering party.

The text will be found unusually clear and concise. The book, however, is considerably out-of-date with reference to modern field methods in precise leveling and base-line work, especially as to the current practice of the U. S. Coast and Geodetic Survey. An excellent bibliography of books on geodesy and least squares is given on pp. 374-376.

JAMES GORDON SEESE,
Capt., Corps of Engineers, U. S. A.

Military Topography for the Mobile Forces, including Map Reading, Surveying and Sketching. By Capt. C. O. Sherrill. 3d ed. xviii and 353 pp. Maps, ills., index. U. S. Cavalry Assoc., Fort Leavenworth, Kan. $2.50. 8½ x 5½.

This book is the authorized text in military topography used in the various service schools of the regular army and the organized militia. "It has been written with the intention of giving to line officers of the Mobile Land Forces the principles and methods of making and using military maps and sketches necessary for a complete mastery of the military possibilities of ground and maps. * * * The end in view is * * * especially to assist officers in acquiring that trained topographical eye which grasps instantly the possibilities and limitations of the terrain in its influence on the military situation."

The object of Part I: Military Map-Reading, is to give a statement of the

principles and a solution of the problems essential to the accurate and rapid use of maps for military purposes. This section, though complete, is very elementary, many apparently very simple problems being worked out with elaborate arithmetical detail. Particular attention is given to scales and scale problems. A table of words and abbreviations found on German war game and tactical problem maps is given.

Part II: Military Surveying, lays especial stress on the use of the plane table and stadia method, as the best means of acquiring skill in accurately estimating distances, slopes, and elevations. This part is very complete, and, as in Part I, every problem is reduced to its lowest terms to meet the needs of the non-technical reader. The use of the level, transit, etc., and various special military service instruments and their accessories, is explained. The instruments and methods of the drafting room are sufficiently explained to enable the student to turn out a finished map. A chapter is devoted to map reproduction.

Part III: Military Sketching, gives in detail the methods used at the army service schools in rapid military sketching, illustrated by a detailed study of the steps followed in particular sketches. At the end of the book are found stadia tables and logarithms of numbers and trigonometric functions.

JAMES GORDON SEESE,
Capt., Corps of Engineers, U. S. A.

Astronomy. A Popular Handbook. By H. Jacoby. xiii and 435 pp. Ills., index. The Macmillan Co., New York, 1913. $2.50. 9 x 6.

This book is intended both to meet the needs of the general reader and also to serve as a good text-book in high schools and colleges. It is admirably adapted for both purposes. No book on astronomy presents more clearly written and adequate statements as to the present condition of astronomical science or more lucid explanations of the phenomena of the universe. It duly emphasizes also the services which astronomy renders to civilization, being essential, in fact, to the regulation of time, survey operations on the surface of the earth, the making of maps and charts and ocean navigation. Part 1 is free from mathematics but Part 2 contains a series of mathematical notes and explanations. The general reader may thus confine his attention to the non-mathematical part of the book while the student should master the whole volume.

METHODOLOGY AND TEACHING

Cours de Géographie Industrielle. Par Maurice Grigaut. Bibliothèque de l'Enseignement Technique. vi and 319 pp. Maps. H. Dunod et E. Pinat, Paris, 1912. Fr. 4.50. 8 x 5½.

A skeleton book summarizing the commerce of the world. Nearly two-fifths of the volume is devoted to France and its possessions. Fourteen pages summarize the elements of general geography, of which two pages are given to climate. The brevity of treatment is indicated by the description of the westerly wind area in one line. The facts of production and commerce are also presented briefly, but for the most part accurately. The maps are generalized and unsatisfactory. The volume is one to be memorized, and through its use pupils could not be led readily to an understanding of the principles of commercial geography. Even the treatment of the home country is by items, the value of which is questionable. RICHARD ELWOOD DODGE.

Questions and Exercises in Geography. (Based on Heaton's "Scientific Geographies.") By Robert J. Finch. xv and 48, 37, 47, 46, 28, 32, 56 and 25 pp. Ralph, Holland & Co., London, 1913 (?). 2s. 6d. 7½ x 5.

A volume of review questions in geography primarily for the use of those preparing to pass the formal test examinations for which so many English geography texts have been written. The author emphasizes the importance of "intelligence" on the part of pupils, and announces that memory questions

"have been relegated to the limbo of forgotten things." The use of maps and diagrams is urged and the candidates are warned to be concise and avoid any endeavor to use smooth English.

The questions cover almost every conceivable topic in the commercial, physical and political geography of the world, and vary from mere memory tests of products and names, to questions calling for much thought and broad comparisons. Many of the questions call for an itemized knowledge that must be as embarrassing to the examiner as to the student—for instance, "Discuss the importance of Libreville, Luluaburg, Stanleyville, Nyangwe, and Leopoldville." Many of the questions are very suggestive to any teacher, but the purpose of the volume as a whole is so foreign to American needs that it offers little of service in our country. RICHARD E. DODGE.

A Commerial Geography of the World. By Frederick Mort. viii and 392 pp. Maps, index. Oliver & Boyd, Edinburgh, 1913 (?) 2s. 6d. 7½ x 5.

A brief readable volume along modern lines. The introductory summary of the geographical facts underlying commerce is too concise to be clear, but does include some note of economical as well as physical principles. The commodities entering into commerce are treated under the head of mineral, animal and vegetable products. Though the paragraphs devoted to any one product are brief, the choice of material is good, and it is well presented. The larger part of the volume is devoted to regional commercial geography. Here the treatment is more satisfactory because the causal relations are better brought out. Diagrams and usable black-and-white maps add to the attractiveness of the volume. RICHARD E. DODGE.

Preliminary Geography. By E. G. Hodgkison. xvi and 225 pp. Maps, index. University Tutorial Press, London, 1913. 1s. 6d. 7 x 5.

A Comparative Geography of the Six Continents. By E. W. Heaton. 219 pp. Maps, ills. Ralph, Holland & Co., London, 1913. 1s. 9d. 7½ x 5.

An Elementary Historical Geography of the British Isles. By M. S. Elliott. x and 172 pp. Maps, ills., index. A. & C. Black, London, 1913. 1s. 6d. 7 x 5.

The Atlas Geographies. Preparatory: British Isles. By T. Franklin and E. D. Griffiths. 33 pp. Maps. Europe. 64 pp. Maps. 6d. each.

Visual Geography. A Practical Pictorial Method of Teaching Introductory Geography. By Agnes Nightingale. Book 2: Continents and Countries. 48 pp. Maps. A. & C. Black, London, 1913. 8d. 9 x 7.

New Era School Atlas. 40 map plates. 6d.

The Scholars Geographical Exercise Book. The British Empire. 16 plates. 2d. W. & A. K. Johnston, Ltd., Edinburgh, 1913. 9½ x 7½. ½d. each.

Taken as a whole, three of these eight small books may be said to contribute something substantial to the field of school geography. Our English friends are turning out little books in geography rapidly, but many of them are simply brief compilations, and the general level of school geography is not advanced by their publication. Frequently the author says that his book covers sufficient ground to meet this or that examination. It is a principle, with few exceptions, that a book written chiefly to fit pupils for some examination has few other merits.

Mr. Hodgkison's "Preliminary Geography" attempts to cover the entire world in 200 small pages. Outside of the chapters dealing with the British Empire, a pupil might almost as well have no geography at all as to have

this dry recital of the barest facts, by no means accurate. See for example the absurd railroad map of the United States with the Central and Union Pacific Railroad reaching to Washington, Philadelphia, and New York. We are also told that Pittsburgh is connected with Lake Erie by a canal.

Heaton's "Comparative Geography of the Six Continents," announces in the preface that it covers World Geography on the scale required for the Junior Local Examinations. The author attempts a causal treatment but seems to feel that he must not make a book that can not be carried in the inside coat pocket and so squeezes all the life out of it and gives us another catalogue of facts, dry, vague, and deadly to any growth of interest in geography.

Elliott's "Elementary Historical Geography of the British Isles" has merit. It does not attempt the impossible; in its 160 pages, it can give and does give enough concrete details to awaken interest. If there is a place for such a book in English schools, this little volume will give English school children some ideas that will stick.

"The Atlas Geographies" have the merit of good physical maps, and of map exercises which form an integral part of the books. Too many places, rivers, etc., are mentioned so that the really important ones may be lost in the multitude. The colored maps are all physical. The only political map of Europe in the book on Europe, is a half-page black and white map. To most persons, the political divisions of Europe are matters of primary interest. On the whole, the Atlas Geographies seem to an American much better than the coat-pocket type of book.

Miss Nightingale's "Visual Geography" is an odd little exercise book for beginners. Its exercises are of the kindergarten busy-work kind, but they are sure to interest little people and to attract them to the study of geography.

"The New Era School Atlas," containing 40 good maps both physical and political, and selling for six pence, is a credit to W. & A. K. Johnston. The physical maps are pleasing in appearance and effective. They reflect German influence.

"The Scholar's Geographical Exercise Book" consists of 16 good outline maps, bound in strong manila covers and selling for the small price of 2 pence.

R. H. WHITBECK.

GENERAL

Islam, Mission, Politik. Von Martin Hartmann. xvii and 162 pp. O. Wigand, Leipzig, 1912. Mk. 3.60. 8 x 5½.

This slight volume is a most energetic discussion of a theme which is engaging the attention of many cultural pioneers. The missionaries of the Christain faith find themselves in rivalry for the amelioration of many races of the primitive types of humanity. Administrators of provinces and protectorates have to deal with the same situation. This is all due to the fact that the faith of Mohammed proves almost immediately acceptable to society of the rudest type and to that extent excites an upward step. Clerical conferences have recently been seriously engaged with the problem which Islam presents and plan a vigorous effort to bring the followers of the Prophet back to the fold. Hartmann has been charged with considering the theme from a line of approach that is too radical. He argues wholly along the line of cultural development and of uplift in the plane of living. It is an able presentation of that secular aspect of the case and will add to the equipment which must be ours before we can deal intelligently with the problem involved.

WILLIAM CHURCHILL.

Der Tropenartz. Ausführlicher Ratgeber für Europäer in den Tropen sowie für Besitzer von Plantagen und Handelshäusern, Kolonial-Behörden und Missions-Verwaltungen. Von Dr. med. Fr. Hey. 2. völlig umgearbeitete Auflage. xii and 435 pp. Index. Hinstorff'sche Verlagsbuchhandlung, Wismar, 1912. Mk. 7.

The researches of Koch, of the Liverpool School of Tropical Medicine, of

the surgeons of our own army and navy, have all contributed to the extreme worth of this manual. No physican would recommend lay practice. It is only in the last resort that any person of common sense would incur the dual risk of error in diagnosis and mistake in treatment. But the last resort is always the ruling condition in the case of most white persons in the tropics—hunters, planters, missionaries, government servants. Therefore Dr. Hey has rendered the service of a conscientious physician in writing this handbook of self-medication. He deals fully with personal hygiene, he teaches persons of fair intelligence how to mark the symptoms of disease and how to deal with it. It is all written in plain terms and is well within the comprehension of the layman. For each disease he supplies the name of the most successful remedy and directions for its use. In view of our national advance upon tropical possessions we could wish that some medical man with tropical experience would translate this work into English or give us a substitute at the same nominal cost which could be put into the hands of all our missionaries and school teachers who have to cut loose from civilization in the Philippines. Their usefulness toward the lower races would be enhanced and we should hear far less of the very present malady of Phillippinitis.

WILLIAM CHURCHILL.

Universities of the World. By Charles F. Thwing. xv and 284 pp. Ills., index. The Macmillan Co., New York, 1911. $2.25. 8 x 5½.

President Thwing wrote these papers at various times. Twenty institutions from Oxford to Tokyo, and from Upsala to Melbourne, are described and characterized. These summaries are the result of personal observation, except Melbourne, which was not visited. The author has tried to catch the spirit of each institution, and to summarize its work especially from the point of view of its utilization of opportunities. The chapters are written from a broad viewpoint, in appealing style, and with force. They are sketches rather than studies. Incidentally, one gets many glimpses of President Thwing's mature judgment as to the strength and weakness of American education.

RICHARD ELWOOD DODGE.

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later

NORTH AMERICA

THE BEGINNING OF SAN FRANCISCO from the Expedition of Anza, 1774, to the City Charter of April 15, 1850. By Z. S. Eldredge. 433 pp. Vol. 2: 837 pp. Map, ills., index. The author, San Francisco, 1912. 8½ x 6.

CALIFORNIA, 1849-1913. The Rambling Sketches and Experiences of Sixty-four Years' Residence in that State. By L. H. Woolley. 48 pp. DeWitt & Snelling, Oakland, Cal., 1913. 50 cents. 9 x 6.

FATHER LACOMBE, the Black-Robe Voyageur. By K. Hughes. xxi and 467 pp. Index, ill. W. Briggs, Toronto, 1914. $1.50. 8½ x 6.

HISTORY OF OHIO from the Glacial Period to the Present Time, including the Civil Government. By J. P. Lawyer, Jr. 345 pp. Maps, ills. The author, Guernsey, Ohio. $1. 8 x 5½.

MANUEL D'ARCHÉOLOGIE AMÉRICAINE. (Amérique préhistorique—Civilisations disparues). Par H. Beuchat. Préface par M. H. Vignaud. xli and 773 pp. Ills., index. A. Picard, Paris, 1912. 9 x 6.

MONOGRAPH OF THE SHALLOW-WATER STARFISHES of the North Pacific Coast from the Arctic Coast to California. By Addison E. Verrill. Part 1: 408 pp. Index. Part 2: Plates. Harriman Alaska Series, Vols. 14 and 15. Smithsonian Inst., Washington, 1914. 10½ x 7½.

SOUTH AMERICA

DANS LA PAMPA. Chasses Impromptues. Par G. Daireaux. x and 225 pp. Ills., index. Hachette & Cie, Paris, 1912. 5s. 2d. 7½ x 5.

FOLLOWING THE CONQUISTADORES UP THE ORINOCO AND DOWN THE MAGDALENA. By H. J. Mozans. xiii and 439 pp. Map, ills., index. D. Appleton & Co., N. Y., 1910. $3. 9 x 6½.

GEOLOGISCH-PETROGRAPHISCHE STUDIEN IN DER PATAGONISCHEN CORDILLERA. Von P. D. Quensel. 113 pp. Map, ills. Reprint, *Bull. Geol. Inst. of Upsala*, Vol. 11, 1911.

TWENTIETH CENTURY IMPRESSIONS OF ARGENTINA. 850 pp.; . . . of Uruguay, 524 pp.; . . . of Brazil, 1064 pp. (History, People, Commerce, Industries, and Resources). Director-in-Chief: R. Lloyd. Editors: W. Feldwick, O. T. Breakspear, L. T. Delaney. Historian: A. Wright. Maps, ills., index. Lloyd's Greater Britain Publishing Co., London, 1911, 1912, 1913. 12 x 10.

AFRICA

DAWN IN DARKEST AFRICA. By J. H. Harris. With an introduction by the Earl of Comer. xxxvi and 308 pp. Map, ills., index. Smith, Elder & Co., London, 1912. 10s. 6d.

DIE MODERNE SPRACHFORSCHUNG IN AFRIKA. Hamburgische Vorträge von C. Meinhof. 143 pp. Berliner evang. Missionsgesellschaft, Berlin, 1910. 8½ x 6.

DIE EISENBAHNEN AFRIKAS. Grundlagen und Gesichtspunkte für eine koloniale Eisenbahnpolitik in Afrika. Herausgegeben vom Kolonialpolitischen Aktionskomitee. viii and 159 pp. Maps. W. Süsserott, Berlin, 1907. 10 x 7½.

IM LANDE DES NEGUS. Von G. Escherich. 207 pp. Ills. G. Stilke, Berlin, 1912. 10 x 6½.

IM MOTORBOAT QUER DURCH AFRIKA. Von P. Graetz. Vol. 1: Vom Indischen Ozean zum Kongo. xvi and 216 pp. Vol. 2: Durch den Kongo und Neu-Kamerun. xvi and 218 pp. Maps, ills. Braunbeck & Gutenberg, Berlin, 1913. 8½ x 6.

THE PASSING OF THE SHEREEFIAN EMPIRE. By E. Ashmead-Bartlett. xii and 532 pp. Map, ill. W. Blackwood & Sons, London, 1910. 9 x 6.

LA BELGIQUE ET LE CONGO. Le passé, le présent, l'avenir. By E. Vandervelde. Series: Bibl. gén. des sci. sociales. 272 pp. F. Alcan, Paris, 1911. 9½ x 5½.

CONGO NATIVES. An ethnographic album. By F. Starr. 38 pp. Ills. F. Starr, Chicago, 1912. $13.50. 12½ x 10.

DU CONGO À L'UBANGI. Mon deuxième voyage dans l'Afrique centrale, par F. Thonner. xi and 125 pp. Maps, ills. Misch & Thron, Brussels, 1910. 10 x 7.

HISTOIRE POLITIQUE DU CONGO BELGE. By A. J. Wauters. xii and 435 pp. Map, index. P. Van Fleteren, Brussels, 1911. 8 x 5½.

LE RÉGIME MINIER DU CONGO BELGE. By D. Coppieters and J. van Ackere. 288 pp. Map. J. Goemaere, Brussels, 1911. 9½ x 7.

AM TENDAGURU. Leben und Wirken einer deutschen Forschungs-Expedition zur Ausgrabung vorweltlicher Riesensaurier in Deutsch-Ostafrika. Von E. Hennig. 151 pp. Map, ills. E. Schweizerbart, Stuttgart, 1912. 9 x 6½.

BERICHT ÜBER DIE TÄTIGKEIT DER ZUR ERFORSCHUNG DER SCHLAFKRANKHEIT im Jahre 1906/07 nach Ostafrika entsandten Kommission. Erstattet von R. Koch, M. Beck, F. Kleine. 319 pp. Map, ills. J. Springer, Berlin, 1909. 11 x 8.

BEITRÄGE ZUR KULTURGESCHICHTE VON OSTAFRIKA. By F. Stuhlmann. Deutsch-Ost-Afrika, etc. Vol. 10. 905 pp. Index. D. Reimer (E. Vohsen), Berlin, 1909. 11 x 8.

CONGRÈS DE L'AFRIQUE ORIENTALE (MADAGASCAR ET DÉPENDANCES—CÔTE FRANÇAISE DES SOMALIS). Tenu à Paris du 9 au 14 Octobre 1911. Compte Bendu des Travaux, publié par Ch. Depince. 821 pp. Map. Congrès Coloniaux Périodiques, Paris, 1912. 11 x 7½.

DIE OSTAFRIKANISCHE ZENTRALBAHN, der Tanganyikaverkehr und die Ostafrikanischen Finanzen. Anhang: Die Kongo-Abtretungen. Kolonialwirtschaftliche Studie. By E. Zimmerman. 51 pp. Ills. D. Reimer (E. Vohsen), Berlin, 1911. 9½ x 6½.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. GEOLOGICAL SURVEY

United States. [Twenty-one base maps of various states, 1:500,000] (1) Alabama. Compiled in 1911 and 1912. (2) Arkansas. Compiled in 1912 and 1913. (3) Delaware. Compiled in 1912. (4) Georgia. Compiled in 1911-12. [No title]. (5) Illinois. Compiled in 1909-10 in cooperation with the State of Illinois: Frank W. DeWolf, State Geologist. (6) Indiana. Compiled in 1909-10. (7) Iowa. Compiled in 1911-12. (8) Maryland. Compiled in 1912 and 1913. (9) Michigan. Compiled in 1910 and 1911. In 2 sheets. (10) Minnesota. Compiled in 1910-11. In 2 sheets. (11) Mississippi. Compiled in 1910-11. (12) Missouri. Compiled in 1914 in cooperation with the State of Missouri: H. A. Buehler, State Geologist. (13) New Jersey. Compiled in 1912. (14) New York. Compiled in 1913. (15) North Carolina. Compiled in 1900 and 1910 in cooperation with the State of North Carolina: Joseph Hyde Pratt, State Geologist. In 2 sheets. (16) Ohio. Compiled in 1910 and 1911.

1 color. (17) Pennsylvania. Compiled in 1910-1911-1912. [No title]. (18) South Carolina. Compiled in 1913. (19) Tennessee. Compiled in 1911 and 1912 in cooperation with the State of Tennessee: A. H. Purdue, State Geologist. (20) Vermont. Compiled in 1910-11. (21) Wisconsin. Compiled in 1910 and 1911. In 2 sheets.—All states compiled under the direction of R. B. Marshall, Chief Geographer, by A. F. Hassan, Cartographer. U. S. Geological Survey, Washington, D. C.

[These are the maps issued to date in the important series of black-and-white state base maps on the scale of 1:500,000 in course of publication by the U. S. Geological Survey. While primarily intended to afford the groundwork for the United States sheets of the International Map of the World (see *Bull.*, Vol. 44, 1912, p. 841), they are invaluable for all the manifold purposes for which a general map of a state is required. The fact that satisfactory general maps of the states are not readily available (the state maps sometimes to be found in the reports of the Federal and state geological surveys or those of the public land states published by the General Land Office have so far been the only ones available,—for the average state maps in general atlases can hardly be termed satisfactory) makes this series especially valuable. The uniform scale is also an advantage. This is only one of many similar general undertakings for which the geographic world is indebted to the U. S. Geological Survey. The promptness with which the maps follows each other—fourteen have been issued in the period from Nov. 1912 to July 1914—is also characteristic of the Survey's methods.

The maps are outline maps only, i. e. they show no relief. The elements shown are drainage, county and, where existing, township boundaries, railroad, steam and electric (these are differentiated), and towns. Where the latter are large enough to be represented to scale, their extent is indicated by the somewhat ungeographic method of shading the whole administrative area, not only the built-up section. A laudable exception is made on recent sheets in the case of New York City and St. Louis. The map of Illinois, which is exhausted in this edition, has been issued, in colors, by the geological survey of that state (for review, see under "Illinois," *Bull.*, Vol. 44, 1912, p. 399), and that of North Carolina, reduced to 1:685,000 and with political coloring of the counties, by the North Carolina Geological and Economic Survey (see under "North Carolina," *Bull.*, Vol. 45, 1913, p. 237). The identity of scale and similarity of treatment of the base of the recent hypsometrical map of Colorado (see under "Colorado: (a)," *Bull.* for April, 1914, p. 315) makes it appropriate to call attention to it in this connection, although, strictly speaking, it does not belong to this series (see *Erratum* in *Bull.* for July, 1914, p. 560). All the maps, except those of Iowa and Vermont, bear the remark "Advance sheets; subject to correction.]

AFRICA

German East Africa. Garnison-Umgebungs-Karte von Massoko. Aufgenommen, konstruiert und gezeichnet von Hauptmann v. Trotha. Reduziert nach den Originalaufnahmen in 1:35,000 v. W. Bobzin auf 1:100,000 im kartogr. Institut v. Dietrich Reimer (Ernst Vohsen), Berlin. 1:100,000. 9°7.4′ - 9°38.7′ S.; 33°31′ - 34°1′ E. 6 colors. Accompanies, as Karte 11, "Begleitworte zu der Garnison-Umgebungs-Karte von Massoko 1:100,000" by H. von Trotha, *Mitt. aus den Deutschen Schutzgeb.*, Vol. 26, 1913, No. 4, pp. 344-350.

[Comparatively large-scale survey of the area between the Kiwira and Lufirio Rivers lying immediately northwest of the northern end of Lake Nyassa, between it and the volcano Rungwe. Relief is in generalized contours in brown, forest in pale green, banana plantations in blue-green, drainage in blue, distinction being made in the latter between the navigable and unnavigable stretches of streams. The absence of all absolute elevations is regrettable.]

Kamerun-Togo. Höhenschichtenkarte von Kamerun mit Togo. Bearbeitet von Max Moisel. 1:2,000,000. 13°5′ N. - 1°20′ S.; 8° - 19° E. 16 colors. With four insets: (1) Togo. Bearbeitet von Paul Springade. 1:2,-000,000. 11°10′ - 5°40′ N.; 0°30′ W. - 1°50′ E. 10 colors. (2) Der Niger-

Benueweg nach Nord-Adamaua und den deutschen Tschadseeländern. 1:6,000,000. 10° - 3⅓° N.; 5½° - 13° E. 2 colors. (3) Übersichtskarte. 1:25,000,000. 14° N. - 1° S.; 1° W. - 19° E. 2 colors. (4) Der Kongo-Verkehrsweg nach Südost-Kamerun. 1:6,000,000. 0° - 6° S.; 8° - 18° E. 2 colors. Accompanies "Begleitworte zu der Höhenschichtenkarte von Kamerun mit Togo in 1:2,000,000" by M. Moisel, ***Mitt. aus den Deutschen Schutzgeb.***, Vol. 26, 1913, No. 4, pp. 339-340.

[Important physical map of Kamerun and Togo, the latter on inset (1). Relief is represented by hypsometrical coloring according to the usual scheme, ranging from greens for the lowlands to browns and reds for the highlands. On the map of Kamerun contours are used for every 250 meters up to 1,000 meters and for every 500 meters beyond that elevation; on the map of Togo the 100 meter contour is shown in addition. Ocean depths are shown in shades of blue, practically the same contour intervals being used as for the relief of the land. The physical coloring is extended to the limits of the map, thus including the adjoining portions of Nigeria, French Equatorial Africa and the whole of Rio Muni. This map is now, in view of its relatively large scale and the completeness of the sources on which it is based, the standard representation of the relief of the regions concerned, superseding the corresponding maps of Kamerun by Passarge, 1:6,000,000, and of Togo, 1:2,500,000, in "Das deutsche Kolonialreich," edited by Hans Meyer.]

AUSTRALASIA AND OCEANIA

Kaiser Wilhelms Land. Route Dr. R. Thurnwald's vom unteren Kaiserin-Augusta-Fluss zur Nordküste von Kaiser-Wilhelmsland. 1:500,000. 3°33′ - 4°20′ S.; 143°28′ - 144°34′ E. Accompanies, on p. 359, "Eine Durchquerung des Gebiets zwischen Kaiserin-Augustafluss und Küste" by [R.] Thurnwald, ***Mitt. aus den Deutschen Schutzgebieten,*** Vol. 26, 1913, No. 4, pp. 357-363.

[Black-and-white sketch map showing route of ethnologist of the expedition from the Kaiserin Augusta River to the coast.]

Oceania. [Maps of various islands:] (a) Nauru. [1:50,000]. [0°33′ S. and 166°55′ E.]. 4 colors.

(b) [Maps of seven islands:] (1) Flint Island. [1:75,000]. 11°25′ S. and 151°48′ W. (2) Enderbury-Isl., Phönix-Gruppe. [1:75,000]. [3°8′ S. and 171°10′ W.]. (3) Malden-Insel. [1:150,000]. 4° S. and 164°55′ W. (4) Starbuck I. [1:150,000]. 5°37′ S. and 155°56′ W. (5) Jarvis-I. [1:115,000]. 0°22′ S. and 160°0′ W. (6) Browse-Insel. [1:40,000]. 14°4′ S. and 123°3′ E. (7) Lacepede-Inseln. [1:150,000]. 16°50′ S. and 122°10′ W.

(c) Angaur. [1:18,000]. 6°54′ N. and 134°9′ E.

(d) Makatea. [1:20,000]. [15°50′ S. and 148°11′ W.]

Accompany respectively as Taf. IVa, XI, XII and XIII, "Corallogene Phosphat-Inseln Austral-Oceaniens und ihre Produkte" by C. Elschner, Lübeck, 1913.

[All, except map (a), black-and-white maps of islands in the Pacific Ocean containing phosphate or guano deposits. The location of these deposits is generally indicated. Map (a) is evidently based on an original survey, thus superseding the best representation heretofore available, namely, that on British Admiralty chart No. 979, which is reproduced on Taf. IVb of the book. The low coral land is shown in green and the higher dolomitic "pinnacle" land in brown, elevation being indicated in meters.]

EDUCATIONAL

North America. (a) Physical Wall Map Series by J. Paul Goode: North America. Werner's equal area projection. 1:6,167,209 (*sic*). 90° - 1° N.; 180° - 5° W. 13 colors. Rand, McNally & Co., Chicago-New York, 1914.

(b) Political Wall Map Series by J. Paul Goode: North America. Same projection, scale and coordinates as map (a). 7 colors. Rand, McNally & Co., Chicago-New York, 1914.

[To one who is interested in the progress of American cartography every

advance is a matter of satisfaction. When this advance is made by the firm which has unfortunately been known rather for the quantity of its output than for geographical excellence there is added reason for congratulation. The present maps are distinctly a step in the right direction. The physical map particularly is a great improvement on the corresponding map in the same firm's Columbia Series (for review, see under "Educational," *Bull.*, Vol. 43, 1911, pp. 799-800), which the present map is presumably intended to replace. The accepted color range from green to brown has been adopted to express relief, supplemented by hachures in brown. The elevation tints are: below sea level, pale green; 0-1000 ft., green; 1000-2000 ft., yellow; 2000-5000 ft., pale brown; 5000-10,000 ft., brown; over 10,000 ft., brick red. Six depths of the sea are also distinguished, namely, between the isobaths of 0, 500, 5000, 10,000, 15,000, 20,000 ft. The continental shelf (0-500 ft.) is left white while the remaining depths are colored in increasingly dark shades of blue. The July 10°, 20° and 30°C isotherms shown in red, and the January —30°, —20°, —10°, 0°, 10° and 20°C isotherms in blue. Ocean currents are shown, cold in blue, warm in red. All cities of over 100,000 are shown and those above 300,000 and above 1,000,000 are emphasized respectively by an overprinted triangle and circle in red.

While the color scheme is in general satisfactory, the transition from the green of the 0-1000 ft. layer to the bright yellow of the 1000-2000 ft. seems rather more abrupt than the physical configuration of the land would warrant. This contrast is heightened by the fact that no contour has been inserted between 0 and 1000 ft.; and still between these lies the critical 600 ft. contour which broadly divides the lowlands from the highlands the world over. The result is that, for instance, the Appalachians seem to rise abruptly from the lowland with no hint of the Piedmont on the one side and the Appalachian Plateau on the other. The isotherms shown, while including the three critical temperatures of 0°, 10° and 20°C for the warmest and the coldest month, the importance of which has recently been urged by Prof. Herbertson, are not balanced between January and July: the comprehensible inclusion of negative January temperatures to cover the northern part of the continent might well have been paralleled by an extension of the July isotherms beyond 20° to correspondingly cover the southern part. The trace of the January isotherms over Greenland, furthermore, does not make allowance for the temperature conditions created by its ice cap, as we now know them: instead of bending gently southward they should practically hug the coast. On the other hand, the representation of the Arctic regions reveals familiarity with recent exploration: the Northeast Foreland of Greenland, the east coast of Victoria Island, even the northern part of Baffin Island and Southampton Island are represented according to latest knowledge—a fact worthy of comment when it is remembered that even so authoritative a map as the geological map of North America published by the U. S. Geological Survey fails in this respect. The full line used to show Keenan Land might create overconfidence in its existence. In the anthropogeographic domain the sound pedagogic principle of elimination of non-essentials has been adopted—in contrast to the previous edition of the map—in the selection of cities, only the most important being shown.

The political map shows, besides the political units and their subdivisions marginal coloring wisely being used instead of the all-too-frequent areal coloring), the main steamship lines, with distance in nautical miles, ocean cables and railroads, trunk lines and secondary lines being differentiated in the latter. Even so, only the more important lines are shown: indeed, the map affords one of the few available critical representations of the railroad routes of the United States,—a subject which is often unsatisfactorily dealt with by foreign compilers, as in the case of Bartholomew's otherwise excellent physical map of the United States (cf. *Bull.*, Vol. 45, 1913, pp. 155-156).

In general treatment, the maps do not always fulfill the requirements of a wall map. The main requirement is legibility at a distance; this is, of course, not attained simply by drawing a map on a large scale, but by using a bold method of representation. What is shown must be discernible from all parts of a class room. Essentials only should be shown—especially in a school wall map—but these should be clearly discernible. This principle has not been fol-

lowed throughout in the present case. Although the main rivers have been emphasized, many are not visible at a distance, particularly if the surrounding color be unfavorable, as in the case of the upper Yukon and the Tanana. The method employed—two heavy black lines enclosing a white one—is not very felicitous. The position of towns is also not evident at a distance, the emphasis of the symbols for cities of over 300,000 inhabitants by a red overprint indicating a recognition of this fact. On the political map the railroad lines likewise cannot be distinguished; the steamship routes can be made out only because of the contrasting and uniform tint of the water. Adequate treatment of all these elements will be found on modern European school wall maps, such as Gaebler's North America, 1:4,500,000, Diercke's United States, 1:3,000,000, or Unstead and Taylor's recent wall atlas of North America, 1:6,000,000.

The scale is stated to be 97 miles to the inch, or 1:6,167,209. Aside from the irreconcilability of these two statements, the expression of the natural scale in numerals to the nearest unit overlooks the fact that the limitations of printing or the liability of paper to shrinkage makes all such niceties futile.

The importance of the present maps lies in the fact that they are the first American maps of this type to emanate from professional geographical circles. Heretofore we have had to rely either on the compilations by unqualified persons in the office of our map publishing firms, whose aims are chiefly commercial and whose standards are far from scientific, or else on foreign material. The advance of geography in this country will inevitably bring about emancipation from these sources, and it is because the present maps are the forerunners in this movement that they deserve special attention.]

Other Maps Received

NORTH AMERICA

Canada

Ontario. Gold producing area Porcupine. 2 in. to 1 mi. Hamilton B. Wills, Toronto, Canada, 1913. $1.00.

Quebec. Scarborough's new census map of Quebec. 9 mi. to 1 in. The Scarborough Co., Hamilton, Ont., 1913.

SOUTH AMERICA

Columbia. Der Alto Chocó (Kolumbbien), von Joh. Kunst. 1:810,000. L. Friederichsen & Co., Hamburg, 1913.

AFRICA

Africa. Bathy-orographical map of Africa. 1:8,400,000. W. & A. K. Johnston, Ltd., Edinburgh, [1914].

Algeria. Algérie. 1:200,000. Feuille 12, Téniet-el-Had; 13, Boghari; 14, Bou Saada. Adolpe Jourdan, Alger, [1914]. 1 fr. ea.

British East Africa. East Africa Protectorate. 1:250,000. Sheet South A37/A, Nakuru-Nyeri; North A36/X, Uasin Gisnu; North A36/Q, Elgon. The Surveyor General's Office, Nairobi, B.E.A., 1913.

Portuguese East Africa. Esboço do territorio de Companhia de Moçambique. 1:2,720,000. Companhia de Moçambique, Lisbon, 1911.

Mineral survey map of portion of the territory of the Companhia de Moçambique, Portuguese East Africa. 16 mi. to 1 in. Companhia de Moçambique, Lisbon, 1912.

Union of South Africa. Union of South Africa, Mines Department—Geological Survey. Sheet 2, Pienaars River, portions of Pretoria, Rustenburg and Waterberg Districts. 2.347 mi. to 1 in. Mines Department, Pretoria, 1911.

ASIA

China. Missionskort over Syd-Manchuriet. 1:500,000. Inset: Manchuriet med omliggende egne, 1:3,500,000. Det Danske Missionsselskab, Kjøbenhavn, 1913. Kr. 1, 50 Øre.

India. Bathy-orographical map of India. 1:3,000,000. W. & A. K. Johnston, Ltd., Edinburgh, [1914].

Turkey in Asia. Historical maps of Bible lands, edited by Charles Foster Kent, Ph.D., and Albert Alonzo Madsen, Ph.D. Sheet 1, Period of the Wilderness Wanderings, 1200-1150 B. C., 20 mi. to 1 in.; 2, Period of Hebrew settlement of Canaan, 1150-1050 B. C., 8 mi. to 1 in.; 3, United and divided Hebrew kingdoms, 1050-586 B. C., 8 mi. to 1 in., with insets: Solomon's Temple, 50 ft. to 1 in., Jerusalem before the exile, 900 ft. to 1 in.; 4, The post-exilic period, 538-63 B. C., 8 mi. to 1 in.; 5, Palestine in the time of Jesus, 4 B. C.-30 A. D. (including the period of Herod, 40-4 B. C.), 8 mi. to 1 in., with insets: Herod's Temple, about 150 ft. to 1 in., Jerusalem during the Roman period, 900 ft. to 1 in.; 6, St. Paul's journeys and the early Christian church, 40-100 A. D., about 55 mi. to 1 in.; 7, Assyrian, Babylonian and Persian Empires, 50 mi. to 1 in. Published jointly by the Methodist Book Concern, The Presbyterian Board of Publication, The Congregational Sunday School & Publishing Society, The American Baptist Board of Publication, and the Christian Board of Publication. The Methodist Book Concern, New York, 1912.

AUSTRALASIA AND OCEANIA

Australia. Map of New South Wales Railways, showing coach and other routes from the various stations, together with mileage from Sydney, with diagrams of North Coast, South Coast, and parts of southern and western lines. 29 mi. to 1 in. Department of Lands, [Sydney], N. S. W., 1913.

EUROPE

Austria-Hungary. Przegladowa mapa geologiczna Galicyi, Dra. Tadeusza Wiśniowskiego. 1:1,500,000. Landesregierung für Bosnien und die Hercegovina, Sarajevo, 1908.

Razdioba Konfesija u Bosni i Hercegovina po resultatima popisa ziteljstva godine 1910. 1:800,000. Landesregierung für Bosnien und die Hercegovina, Sarajevo.

Postkurs-Karte von Bosnien und der Herzegovina. Bezirk der k. u. k. Militärpost- und Telegraphen-Direktion in Sarajevo, 1913.

Balkan Peninsula. Flemmings namentreue (idionomatographische) Länderkarten: Blatt 7, Karte der Balkanhalbinsel. 1:1,500,000. Bearbeitet von Otto Herkt. Carl Flemming, Verlag, Berlin, [1913]. M. 3.50.

British Isles. Railway map of the British Isles, by John Bartholomew, F.R.G.S. 19 mi. to 1 in. Insets: London & Suburbs; Enlargement of South Lancashire & Yorkshire District; Enlargement of Edinburgh and Glasgow District; Birmingham and District; Newcastle and District, Swansea and Cardiff District. John Bartholomew & Co., Edinburgh, [1914]. 1/-.

Bacon's plan of the Borough of Blackburn. 6 in. to 1 mi. G. W. Bacon & Co., London, [1913]. 1/-.

Bacon's plan of Exeter and suburbs. 6 in. to 1 mi. G. W. Bacon & Co., London, [1913]. 1/-.

Bacon's new plan of Leeds and suburbs. ¾ in. to 1 mi. G. W. Bacon & Co., London, [1913]. 1/-.

New "Half-inch" cycling road maps of England and Wales—Cambridge District. 2 mi. to 1 in. G. W. Bacon & Co., London, [1913]. 1/-.

New "Half-inch" cycling road maps of England and Wales—Preston District. 2 mi. to 1 in. G. W. Bacon & Co., London, [1913]. 1/-.

New "Half-inch" cycling road maps of England and Wales—North Devon. 2 mi. to 1 in. G. W. Bacon & Co., Ltd., London, [1913]. 1/-.

New "Half-inch" cycling road maps of England and Wales—South Devon. 2 mi. to 1 in. G. W. Bacon & Co., [1913]. 1/-.

Central Europe. Düms' Comptoir- und Reisekarte von Mitteleuropa, nach amtlichen Quellen bearbeitet. 28. Auflage. 1:2,160,000. W. Düms, Wesel, [1913]. 60 Pf.

Neueste Eisenbahnkarte von Mittel-Europa, nach amtlichen Quellen bearbeitet. 1:2,160,000. W. Düms, Wesel, [1913].

France. Flemmings namentreue (idionomatographische) Länderkarten: Blatt 2, Karte von Frankreich. Bearbeitet von Otto Herkt. 1:1,500,000. Insets: Bordeaux, 1:150,000; Paris und Umgebung, 1:500,000; Paris 1:150,000; Corse. Carl Flemming, Verlag, Berlin, [1913].

Germany. C. Kiesler's Reise- u. Eisenbahnkarte von Deutschland und den angrenzenden Ländern zum Gebrauch für das Contor und die Reise. [1:2,200,-000.] Verlags-Institut Richard Kühn, Leipzig, 1914. 50 Pfg.

Eulitz' Kreiskarten der Provinz Pommern. 1:100,000. Sheets: Lauenburg, Köslin, Usedom-Wollin. Oscar Eulitz, Verlag, Lissa i. P., 1913. Mk. 0.75 ea.

Wanderkarte für das obere Saaltal und den Frankenwald. 2. Auflage. 1:50,000. Inset: Frankenwald, 1:100,000. Fr. Krüger, Lobenstein, [1913].

Schiläuferkarte der Berchtesgadener Alpen. 1:100,000. Oskar Brunn, München, [1913]. Mk. 1.75.

Skitourenkarte vom Ammergebirge, herausgegeben vom Wintersportsverein Oberammergau. 1:100,000. Oscar Brunn, München, [1913].

Brunn's Spezialkarte der Südöstl. Umgebung Münchens, umfassend das Gebiet nördl. bis Schwaben, östl. Wasserburg a/Inn, südl. die Tegernseer- und Schlierseerberge bis Kufstein. 1:100,000. Oscar Brunn, München, [1914]. 2 Mk.

Schwarzwald Spezialkarte, Blatt II, Renchen, Freudenstadt, Schiltach. 1:75,000. Geogr. Anstalt Kümmerly & Frey, Bern, [1913]. Mk. 2.

Germany-Austria. Brunn's Strassenkarte von Südbayern und Tirol mit den angrenzenden Ländern. 1:800,000. Oskar Brunn, Kartogr. Anstalt, München, [1913]. Mk. 1.20.

The Netherlands. Ten Brink's Groote Kaart van de Provincie Limburg. Ten Dienste van Handel en Verkeer naar officielle bronnen bewerkt door J. de Regt, met alfabetischen klapper en plaatsbepaler 1:150,000. H. Ten Brink, Meppel, [1914].

Norway. Generalkart over det sydlige Norge i 18 Blade. 1:400,000. [Sheets bear various dates up to 1901]. Norges geografiske Opmaaling, Kristiania. Kr. 0.60 ea.

Valkart over Norge, utarbeidet av Johan Ydstie og Arne Blom. Forlagt av Cammermeyers Boghandel, Kristiania, 1913.

Switzerland. Map indicating the special regulations concerning the circulation of auto-cars in Switzerland. 1:500,000. Federal Department of the Interior, Bern, [1913].

Carte officielle des chemins de fer Suisses. 1:250,000. 4 sheets. Service topogr. fédéral, Bern, 1913. Fr. 2.50 each.

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Westliches Russland mit den deutschen, österreichisch-ungarischen und rumänischen Grenzgebieten. 1:2,000,000. Carl Flemming, Berlin, [1913]. M. 1.

Map of the Gouvernement Poltawa. [In Russian]. 20 versts to 1 inch. A. Ilyin, St. Petersburg, [1913].

WORLD AND LARGER PARTS

Imperial map of the world in hemispheres. Equat. scale 1:22,500,000. Insets: North Pole from 50° N. Latitude; South Pole from 50° S. Latitude; Hemisphere showing greatest amount of land; Hemisphere showing greatest amount of water. W. & A. K. Johnston, Ltd., Edinburgh, 1914.

The world on Mercator's projection. Equat. scale 1:33,500,000. Insets: New Zealand, Tasmania, Cape of Good Hope, Malta, Eastern Canada, India, West Indian Islands, British Guiana, Channel Islands. W. & A. K. Johnston, Edinburgh, [1914].

ATLASES

Calendario-Atlante de Agostini, Anno XI, Serie II, Vol. 1, con notiziario redatto da L. F. de Magistris. [24 plates and index.] Istuto Geografico de Agostini, Novara, 1914. 1 lira. 6 x 3 inches.

Testo-Atlante delle ferrovie e tramvie italiane e di quelle estere in contatto, con un indiceprontuario di tutte le linee stazioni, fermate, scali, ecc., delle ferrovie, tramvie e laghi italiani. 6 diagramme intercalati nel testo e 30 tavole. Istituto Geografico de Agostini, Novara, 1913. Lire 5. 8½ x 5 inches.

L. L. Poates & Co.'s Handy Atlas of the World, containing maps of the United States, its 48 states, territories and insular possessions, Dominion of Canada, each of the provinces and foreign countries. [78 pages of maps and index.] L. L. Poates Publishing Company, New York, 1914. 8 x 6 inches.

Philips' Handy-Volume Atlas of the World, containing seventy-four new and specially engraved plates with statistical notes and complete index. Ninth edition, revised to date. By E. G. Ravenstein, F.R.G.S. George Philip & Son, Ltd., London, 1910. 6 x 4 inches.

Philips' Pictorial Pocket-Atlas and Gazetteer. 148 pages of maps, pictures and statistical diagrams, with gazetteer-index of 18,000 names. George Philip & Son, London, [1913]. 1/-. 6 x 4.

Atlas of the World. [34 pp. and index.] The Cunard S.S. Co., New York, 1911. 7 x 6 inches.

Handels-Atlas zur Verkehrs- und Wirtschaftsgeographie. Für Handelshochschulen, kaufmännische, gewerbliche und landwirtschaftliche Lehranstalten, sowie für Kaufleute und Nationalökonomen. Herausgegeben von A. Scobel. 68 Haupt- und 73 Nebenkarten sowie 4 Diagramme auf 40 Kartenseiten. Velhagen & Klasing, Bielefeld & Leipzig, 1902. 5 Mk. 50 Pf. 13 x 10 inches.

Atlas antiquus, in forty-eight original, graphic maps, with elaborate text to each map and full index. By Emil Reich. Macmillan & Co., London, 1908. 10½ x 8 inches.

Cartes et croquis des campagnes de 1789 à nos jours, avec sommaires explicatifs. [By] R. Jalliffier & A. Buchner. 5e édition. Garnier Frères, Paris, [1913]. 10½ x 7½ inches.

Cohrs' Atlas över Sverige. Fullständig reskarta i fickformat utarbetad och graverad av Edvard Cohrs, med geografiska och statistika uppgifter, jänte fullständigt namnregister. Nionde upplagan. Aktiebolaget Ljus, Stockholm, 1913. 3 Kronor. 8 x 5 inches.

Historisk Skole-Atlas. [By] Gustav Rosendal. [6 double pages of maps.] Rasmus Handels Boghandel, Odense, [1913]. Kr. 75 Øre. 12 x 9 inches.

Schoolatlas van Nederlandsch Oost-Indië, door W. van Gelder, Oudinspecteur van met Inlandsch Onderwijs. Twaalfde, herziene druk, (met alphabetische lijst van alle namen). J. B. Wolters, Groningen, 1914. F. 1.90. 13 x10 inches.

Missions-Atlas der Brüdergemeine. Achtzehn Karten mit erläuterndem Text. Herausgegeben von der Missionsdirektion der evangelischen Brüder-Unität. [18 plates.] Missionsbuchhandlung, Herrnhut, 1907. Mk. 3.50.

Bacon's large scale atlas of London and suburbs (revised edition) with an alphabetical index of over 20,000 names. With additional road maps of the home counties and a series of 13 special maps showing the different areas controlled by Government departments, local authorities, and supply companies, having statutary powers in and around the city and county of London. Edited by William Stanford. [56 sheets, loose in bound folio.] G. W. Bacon & Co., Ltd., London. 14 x 21½ inches.

Graphisch-statistischer Atlas der Stadt Nürnberg. [24 maps and index.] Selbstverlag des Stadtmagistrats, Nürnberg, 1913. 11 x 7 inches.

AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156TH STREET

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THE HOME STUDY OF CORAL REEFS*

By W. M. DAVIS
Harvard University

In the statement at the beginning of the second paragraph above, the phrase, "previously eroded valleys," occurs. This should be emphasized, for it is evident that embayments of another kind, namely, those formed by the irregular growth or by the partial engulfment of a volcanic island, do not indicate subsidence. Hence it is important that valleys of erosion, such as are normally excavated by consequent streams on the slopes of an extinct volcano, should be distinguished from the depressions between lava-flow promontories, and from the graben-like depressions or engulfments by which the slopes of volcanic cones are sometimes breached. A characteristic feature of valleys of erosion, and one in which they differ from engulfed graben, is their somewhat symmetrical repetition all around a volcanic cone,—unless one side be much drier than the other; another characteristic feature is the outcrop of eroded lava beds on the valley sides, and in this way valleys of erosion differ from unfilled depressions between two non-eroded flows. Depressions of uncertain origin may of course occur in the flanks of one volcano or another, but, as a general rule, valleys of erosion can be recognized; and it may be fairly believed that the depressions occupied by bays in the central islands of so many barrier reefs are true valleys of erosion, simply on the evidence of their form and their radial arrangement as represented on large-scale charts.

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* Concluded from pp. 561-577 and 641-654.

The logical value of this consequence in giving support to the theory of subsidence is very great, inasmuch as the facts, for which it provides the mental counterparts, were entirely unknown when the theory was invented; inasmuch as they are not accounted for by any other theory, with the possible exception of the eighth in the present list; and inasmuch as they are easily recognizable and indisputable—much more so indeed than the evidence supplied by biotic relations.

A corollary of the formation of embayments by the subsidence of a dissected island is that the growth of deltas will be prevented, or at least retarded; for a short stream draining a small valley may not be able to build up a delta fast enough to keep the sinking delta surface above sea level; but, on the other hand, a larger river draining an extensive catchment area may bring down so much sediment as to fill an embayment and build forward its delta as a salient, even if the delta growth is reduced by subsidence to a less rapid rate than it would have on a still-standing island. Hence the deltas formed by certain rivers on the larger islands of the Fiji group do not of themselves necessarily testify to a still-stand, much less to an elevation of those islands.

A second corollary is that the lagoon deposits, consisting chiefly of horizontally bedded limestones with interbedded gravels, sands and muds along their inner margin, must unconformably overlie a more or less eroded and dissected land surface; thus, in their relation to the volcanic rocks that they cover, as well as in their own structure, they are significantly different from the reef-mass formed by outgrowth from a still-standing island; and in uplifted reefs these differences ought to be discovered by critical search.

A third consequence of the present theory is that, like elevation, subsidence may be unequal in the neighboring islands of the same group; for there is no reason to suppose that the deformation of the ocean bed is perfectly uniform. This consequence is of peculiar interest, because it is unlike the uniform rising of the sea in all parts of the ocean, by which, according to the last theories here to be discussed, the effects ordinarily ascribed to subsidence are accounted for. Unequal subsidence may, however, be difficult to recognize in nature. A test case may perhaps be imagined:—let a newly uplifted, elongated island suffer partial dissection while a fringing reef is formed around its shore line; let it then be elevated some 500 feet, and let mature valleys be eroded down to the new sea level, while a new fringing reef is formed around the new shore line; finally, let unequal subsidence take place, whereby the

island is depressed only fifty feet at one end and 500 at the other, and, during this subsidence, let the second fringing reef be transformed into a barrier reef. As a result of all these changes, the island will have a slightly embayed shore line at one end where the remnants of the first formed fringing reef stand 450 above sea level, and a deeply embayed shore line at the other end, where the first reef remnants will be at sea level; and the new barrier reef will stand near the slightly embayed end of the island but farther out from the other end. Indeed, even without the remnants of the elevated fringing reef, the systematic relation of increasing length of the drowned-valley embayments and the increasing width of the barrier-reef lagoon, from one end of the island to the other, would go far toward demonstrating unequal subsidence. If a long island were depressed at one end and elevated at the other, the increasing effects of these opposite movements on either side of the medial fulcrum might be recognized. There have been abundant speculations of a general nature regarding unequal subsidence of large oceanic areas, but few if any detailed studies of unequal subsidence in single groups of islands; yet it would seem that, in the many island groups of the Pacific, the peculiar consequences of unequal subsidence here pointed out might be found. They should certainly be looked for.

A fourth consequence must not be overlooked. If subsidence has taken place in the Pacific Ocean over a large area and to a great amount in modern geological time, as Darwin inferred from the features of coral reefs, and as some zoologists are prepared to demonstrate on the evidence of related faunæ of many islands, a large volume of water must have been supplied from elsewhere to cover the subsided area. It is sometimes assumed that the needed water volume was drawn from all parts of the ocean, and that as a result the sea level would be everywhere depressed and many shallow sea bottoms would be laid bare as lowlands on continental borders. When it is found that lowlands of geologically modern emergence do not appear to be so extensive as this argument demands, wide-spread modern subsidence in the Pacific is held to be disproved.

But the assumption that the needed water volume is drawn from all parts of the ocean is unnecessary and improbable; for it is based on the associated assumption that the only sea-bottom change is in the region of subsidence, and this is unreasonable. It should not be supposed that the subsidence of a large area in the Pacific means that the earth-radii beneath it have been simply shortened,

as if that part of the earth's inner substance had contracted. It is vastly more reasonable to suppose that, if a certain Pacific area subsided, adjoining areas were at the same time upheaved by a lateral transfer of sub-crustal material from beneath the subsiding area; furthermore it is not unreasonable to suppose that the volume of crustal upheaval is about the same as the volume of crustal subsidence; and in such case no great amount of water would be withdrawn from other parts of the ocean, and few continental lowlands would emerge; indeed if part of the subsiding area had been previously above sea-level, as in a mid-Pacific continent, while none of the upheaved areas rose above sea-level, then on the assumption of equal crustal volumes being depressed and upheaved, the effect of the double change would be, not to lower, but to *raise* the general surface of the ocean, and thus to submerge continental lowlands and to produce innumerable rias by drowning valleys. The upshot of all this is that, as the conditions of compensation for subsiding areas are unknown, this consequence of the theory of subsidence need not be pursued further.

When Darwin's evidence is supplemented by the evidence of shoreline embayments and by that of related plants and animals, the theory of subsidence appears successful in explaining a great number of barrier reefs, and it thus becomes probably successful in explaining atolls also. It has an admirably ingenious simplicity. Its main postulate is reasonable, particularly in the revised form of prevailing and predominating subsidence, not infrequently interrupted by pauses and occasionally alternating with small uplifts. The theory of subsidence therefore appears to be well supported by the review here made. It is gratifying to see that it is supported also by the recent observational studies on Pacific reefs made by Hedley, Taylor, Marshall and other Australasian investigators. Judgment as to its verity must, however, be suspended until certain other theories have been considered.

Uplifted Reefs, worn down.[18] Certain fringing and barrier reefs and atolls are surmounted by more or less disconnected masses of calcareous rock, up to a hundred feet or more above sea-level. It is believed that such masses are remnants of formerly larger sea-level reefs or deep-sea limestones, which have uplifted and more or less completely worn away; the present sea-level reef being established on the denuded outer margin of the older mass; hence, in this connection, the general study of uplifted reefs may be in-

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[18] A. Agassiz: The Islands and Coral Reefs of Fiji, *Bull. Mus. Comp. Zool., Harv. Coll.*, Vol. 33, 1899. See p. 43.

troduced. If the present sea-level reef be a barrier or an atoll, the floor of the enclosed lagoon would, according to this theory, have to be reduced below sea-level by the action of solution or other destructive process on the uplifted limestones. It may be noted that the destruction of the uplifted reef must usually be ascribed to non-marine erosion, because the growth of reef-building corals along the new shore line will ordinarily defend it from the attack of the sea.

The structure, and hence the condition of formation of an uplifted limestone is seldom specified. If it be a deep-sea limestone, its even bedding and its fossils should reveal its origin; and in this case the relation of the limestone to its foundation would be of particular interest, for if the contact of the two be unconformable, a great subsidence previous to the deposition of the deep-sea limestone would be indicated. If the elevated limestone were formed as a reef around or upon a volcanic island without accompanying subsidence, the structure of the reef should, as noted under the second and third theories here discussed, give indication of such an origin, provided that the reef is not too much worn away; in this case the foundation, where covered by so much of the uplifted reef as still remains, should not be an eroded surface, for that would indicate that the foundation was a subsided instead of a still-standing island. Furthermore, some signs of erosion of the central island, if one be present, and of deposition of its detritus in deltas with respect to the former base level should be found at a height at least as great as that of the highest visible parts of the uplifted reef now remaining. Again, a deeper erosion of the central island and of its earlier deltas should have taken place with respect to the present base level since uplift, and to an amount appropriate to the dissection and denudation of the uplifted reef; if the uplifted reef be seen only in small remnants, the deeper erosion may now be so far advanced as to have destroyed all traces of the earlier erosion. Deltas deposited since uplift should form conspicuous salients if the central island be large and if the uplifted reef be nearly consumed; but the delta heads should not fill former embayments, because the shore line of a volcanic island, when uplifted for the first time, has no such forms. Finally, neighboring islands should not exhibit biotic relations, indicative of evolution from common and somewhat remote ancestors, for such kinds of their plants and animals as are not capable of transporting themselves, and as are not subject to accidental transportation.

It is, on the other hand, conceivable that the uplifted limestones

may represent a reef formed during a former period of subsidence. This would seem to be eminently possible in the case of uplifted limestones that surmount, by a moderate altitude, the reefs of atolls, the mass of which rises in flat-topped cones from a considerable depth and in such a form as could hardly be imitated by the uplift of blocks of wide-spread, deep-sea strata; especially if these atolls are associated in such a way with neighboring barrier reefs possessing embayed, central islands as to make it probable that subsidence has had a dominant share in the formation of both. In the case of an uplifted barrier reef, formed during subsidence and still well preserved, the reef structure, the lagoon limestones, the former shore line features of the central island, and the unconformable relation of the reef mass to the foundation that it buries, should all correspond to the conditions outlined under Darwin's theory: in the uplifted reefs of Cuba, an eroded foundation surface and an unconformable contact is implied by Crosby's statement,[19] that the reefs rest on "ancient and non-calcareous mountains," and by Hill's structural cross sections[20]: this demonstrates subsidence before or during the deposition of the reefs. Furthermore, the present shoreline of the central island might, in case uplift occurred long ago, exhibit resurrected or re-excavated valleys, bordered with terracing remnants of their former deposits, and floored with new, low-level flood plains, sloping gently to the sea, and fronted with salient deltas; but there should be no unfilled embayments. In the case of uplifted and greatly denuded barrier reefs, on or around which a new barrier reef has been formed, it would of course be difficult to apply the structural tests regarding the origin of the earlier reef. In barrier reefs as well as in atolls which bear remnants of denuded uplifted reefs, if the lagoon is as much as twenty fathoms in depth, it could be best accounted for, as Darwin noted, by slight subsidence after greater uplift and extensive denudation.

Special attention should be called to the unlike features presented between recently uplifted reefs that had been previously formed by outgrowth around a still-standing central island, and recently uplifted reefs that had been previously formed by upgrowth around a subsiding central island. Reefs of the first kind should contour around the former shore line, but without entering any valleys that may have been eroded with respect to the then

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19 W. O. Crosby: On the Elevated Reefs of Cuba, *Proc. Bost. Soc. Nat. Hist.*, Vol. 22, 1882, pp. 124-130. See p. 125.

20 R. T. Hill: Cuba, *Natl. Geogr. Mag.*, Vol. 9, 1898, pp. 193-242. See p. 201.

sea-level; its thickness, as revealed by borings, should be fairly uniform at a given distance from the former shore line, and should increase with much regularity seaward. Reefs of the second kind, or their lagoon limestones, should enter every valley, so as to extend inside of a line connecting the outermost outcrops of volcanic rocks in the spur ends at the former shore line; the thickness of the reef deposits should increase opposite each valley, and decrease opposite each spur. Silence of observers regarding these strongly contrasted features, as well as regarding reef structure, makes it impossible at present to decide as to the origin of uplifted reefs; for, as far as I have read, few of the facts corresponding to these special consequences have been looked for, probably because the consequences have not been consciously deduced by the observer who had the chance of looking. Lister has described the uplifted reefs of the Tonga Islands,[21] but does not specify their structure. Andrews has studied a number of uplifted reefs in the Fiji group[22] and shows that some of them, at least, are largely composed of horizontally bedded, non-coralline limestones; this would seem to suggest upward rather than outward growth: whether these reefs lie on eroded or non-eroded foundations is not clearly brought forth. Even if looked for, some of the facts may be hard to find; but it would seem that the relation of an uplifted barrier reef to the valleys in the dissected volcanic mountain that it surrounds ought to be easily discovered. In the absence of special records, judgment should be suspended for the present.

The limestones of some of the uplifted and denuded masses, which surmount modern reefs, are said to be of Tertiary age; but the evidence on which this date is ascribed to them is not published in full. In any case the date of the limestones—so long as they are geologically modern—is not so significant in its bearings on the origin of coral reefs as has been intimated, inasmuch as any good theory of reef formation should apply in one geological period as well as in another. Should the uplifted limestone masses be shown to be largely of coral reef and lagoon origin, and of such structure as indicates subsidence during their formation, a very simple and reasonable addition to Darwin's main theory, which he himself recognized (Coral Reefs, p. 140), would suffice to account for them; and the theory would thereby be recommended as providing the counterparts of a somewhat remote as well as of a geologically

21 On the Geology of the Tonga Islands, *Quart. Journ. Geol. Soc.*, Vol. 47, 1891, pp. 590–617.

22 Notes on the Limestones and General Geology of the Fiji Islands, *Bull. Mus. Comp. Zool., Harv. Coll.*, Vol. 38, 1900.

recent past. Should the limestone masses bear indication of formation as outgrowing reefs on still-standing islands, or of deposition on a deep-sea bottom, other theories than Darwin's would be thereby supported.

It has been suggested that the theory of uplifted and worn-down reefs might find a wide application in explaining many reefs and atolls, in which practically all the uplifted mass has been worn away; but to suppose "that the uplifted parts [of existing atolls] have been worn down by the surf, and thus have escaped observation, is overruled by the very considerable depth of the lagoons of all the larger atolls," as Darwin noted years ago (Coral Reefs, p. 146); and to suppose that existing barrier reefs have been similarly uplifted and worn down is negatived for many cases by the drowned valleys of the central islands, as Dana might have pointed out. It may be added that a barrier reef could not be formed in this way around an island on which elevated reefs still exist as fairly continuous terraces, for that would be blowing hot for the worn-away uplifted reef and cold for the still-preserved uplifted reef, in the same theoretical breath; and yet barrier reefs around islands that bear uplifted reefs are not unknown.

8. *Coral Reefs and the Glacial Period.*[23] An exceptionally ingenious theory for the explanation of coral reefs remains to be considered. In essence, it postulates still-standing banks or islands, on or around which reefs of various dimensions had been formed by upward and outward growth in preglacial time; then, on the advent of the glacial period, sea-water is withdrawn to supply glaciers and ice sheets on the continents and the sea-level is lowered 200 feet or more, and at the same time the corals on most of the reefs are killed. Thereupon the sea waves attack the undefended slopes of the reefs and cut them down to a smooth platform a little below the sea-level of that time; afterwards, with the re-establishment of a milder climate, coral larvæ, floating from reefs that have not been killed, re-establish themselves on the outer border of the platform, and, with the melting of the continental glaciers and the rise of sea-level, the new reef grows upward and encloses a lagoon, of which the depth and the smooth floor are thought to be better accounted for in this way than in any other. Islands like the Maldives are regarded as truncated reefs, incompletely built up to present sea-level.

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[23] A. Penck: Morphologie der Erdoberfläche, Stuttgart, 1894, Vol. 2, p. 660.
R. A. Daly: Pleistocene Glaciation and the Coral Reef Problem, *Amer. Journ. Sci.*, Vol. 30, 1910, pp. 297-308.

A still-standing bank or island is here, as in other theories, improbable. The withdrawal of sea-water to form continental glaciers and the lowering of the sea-level during the glacial period is not to be doubted: it must have taken place repeatedly, for whether ice-free interglacial epochs occurred on the continents or not, great advances and retreats of the continental ice-sheets certainly took place; as the successive advances were of different measures, the successive lowerings of the sea-level must also have been of different measures; the several periods of greatest lowering must have been relatively short. The maximum number of feet by which the sea-level was lowered may have been less than the amount above quoted, because the depression of certain glaciated lands, like Labrador and Scandinavia, while ice sheets lay on them, was presumably compensated by an uplift of the neighboring sea floor, and that would have tended to raise the sea-level. Whether the reduction of the ocean temperature was sufficient to kill the corals on most of the reefs or not is truly a difficult matter to determine; but if it be for the moment assumed that the corals of most reefs were killed, a number of peculiar consequences, not announced in the original statement of the theory, remain to be deduced.

Plants and animals on neighboring islands would not show relationships indicative of slow change from common ancestors, unless the depth of water separating their islands was less than the lowering of sea-level during the glacial period; and the evolutionary changes from common ancestral forms would not be greater than could have taken place in Pleistocene time.

Barrier reefs and atolls on which the corals were not killed would have been defended from wave attack, for the corals would have migrated down the outer slope of the reef as the sea was lowered. The reefs thus defended should include all those which are surmounted by elevated limestone masses, such as were considered under the preceding theory, on their outer margin overlooking a submarine slope into deep water: for had the reefs not been defended, all such elevated masses, well exposed to undermining by sea attack, would have been cut away by the waves while the sea stood at its lower level. It is significant that several examples of such surmounting limestones occur in the Fiji Islands and many more in the Paumotus, as described by Agassiz: he instances some small islands on the rim of an atoll (Ngele Levu) in the northeast part of the Fiji group, which "consist entirely of coral rock elevated to a height of over sixty feet on the larger

island," and with deep water up to the shore line on the north side.[24] Some of the uplifted limestones observed in the Paumotus are described as "Tertiary"; if their more definite date were late Pliocene or early Pleistocene, that would prevent their interpretation as having been formed and uplifted in postglacial time. Hence the corals on these reefs and in many other reefs farther west were presumably not killed during the glacial period, and this element of the present theory would therefore seem to have less wide-spread application than has been urged. The lagoons of these reefs are not exceptionally shallow; and yet according to the present theory they should be so; and furthermore, when uplifted "Tertiary" limestone occurs on a barrier reef, thus testifying to the persistence of the reef during the glacial period, deltas should extend forward into the lagoon from each valley of the central island—in so far as the preglacial lagoon floor and the deltas were not cut down by stream channels, or worn by solution into irregular honeycombed forms, while the sea was lowered. So far as the structure of the reef is determined by boring or otherwise, it should exhibit the outward-dipping strata characteristic of reefs formed on still-standing islands, and it should have a minimum of horizontal lagoon strata. The breadth of the reefs should be proportionate to the length of preglacial time during which the reef had been growing outward, and hence to the dissection of the central island also. The central islands, which could have had no drowned valley embayments in preglacial time, because no subsidence had then taken place, should now have drowned valleys only of such length and breadth as could have been eroded in the floors of the preglacial valleys while the sea was lowered; this point is considered in more detail below.

All oceanic islands of preglacial date, outside of the coral and the glacial seas, should have a sea-cut platform of breadth proportionate to the duration of maximum glaciation, and now submerged in some 200 feet of water; cliffs, more or less completely submerged, should rise from the inner border of the platform, and drowned valleys should extend inland. All continental coasts should have similar features, except in so far as they were covered by ice, or in so far as the continents themselves suffered changes of level by which the development of these features was modified or prevented.

Atolls on which the corals were killed could hardly have been

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[24] A. Agassiz: The Islands and Coral Reefs of the Fiji Group, *Amer. Journ. Sci.*, Vol. 5, 1898, pp. 113–123. See p. 116.

truncated to a uniform depth unless they were comparatively small, for the level truncation of a large atoll demands a long stand of the sea at its lowest level during a single glacial epoch, and the return of the sea to the same lowest level in successive glacial epochs; and these are unreasonable postulates. The complete truncation of an atoll to one level could have been accomplished only during the maximum phase of the glacial epoch which abstracted the most water from the sea, and a single maximum phase could have hardly held its value long enough for the level truncation of a large atoll. During the rise of the sea, when abrasion was most effective, the waves would have cut a slanting platform in so much of the atoll as was not already worn away; hence the level surface of truncation, which is regarded as a characteristic result of this theory, seems of improbable realization in large atolls; and some other cause should be found for the smooth lagoon floor of large atolls such as seem to be thus truncated. Very large atolls, on which the corals were killed, might not have been completely truncated, and hence should to-day possess a mesa-like shoal or island in the center of their lagoon; and very broad barrier reefs, not protected by living corals during the lower stand of the sea, might still retain a bench-like part of their preglacial surface, more or less completely delta-covered, around the base of the central island; the bench might be trenched if crossed by streams, and the trenches would now be occupied by bays; outside of the bench, an abraded platform, cut to a lower level, would be submerged and enclosed as a lagoon by a new reef. But the great barrier reef—nearly an atoll—of Hogoleu, or Truk, in the Caroline Islands, thirty miles in diameter, shows no residual bench although its lagoon is from twenty to thirty fathoms in depth.[25]

The form of the valleys eroded in the central island of a barrier reef during the lower stand of the sea and now drowned, demands special consideration in relation to the features produced by marine abrasion. The most significant element of such valleys to-day is not their depth, for that may have been diminished by an unknown measure of deposition, but their breadth in relation to that of the preglacial valleys beneath which they were deepened; for their breadth would be little changed by the waves of the quiet lagoon waters and this change could be recognized and allowed for. Let it be remembered that the preglacial valleys extended to the island border, for no embayments could have existed then; hence the

[25] A. Agassiz: The Coral Reefs of the Tropical Pacific, *Mem. Mus. Comp. Zool., Harv. Coll.*, Vol. 28, 1903, p. 354.

whole length and width of the present embayments must result from the drowning of the deep-cut valleys of the glacial period.

In case the preglacial valleys were narrow, because the islands in which they were eroded had been formed shortly before the date of the glacial period, the deepening of the valleys during glacial times might so completely undercut the walls of the previously eroded valleys that the latter could not be recognized to-day. But if the island were ancient enough to have suffered mature erosion in preglacial time, the incision of deeper valleys during the glacial period might not undercut the higher slopes of the enclosing ridges and spurs; and thus two-cycle valley forms might be produced. Two cases may be here distinguished; namely those of small and of great abrasion, as a result of short-lived and long-lasting abrasion during a lower stand of sea-level.

Short-lived abrasion would, as above noted, leave unconsumed benches in large atolls and in wide barrier reefs; but it might almost completely truncate a small atoll, or almost completely remove a narrow barrier reef; its complete success in such removal would be prevented by the resistance of the volcanic rocks as soon as a contraposed[26] shoreline was developed. Corresponding stream erosion on the central island would produce only narrow gorges; and these when drowned would give rise to narrow bays enclosed by steep walls rising to an "edge" or shoulder, where they undercut the gentler slopes of the preglacial valley sides. The "edge" must be carefully distinguished from a structural bench formed by the outcrop of a single lava bed: a true "edge" should be relatively indifferent to structure; it should begin close to sea-level at the outer rim of the island, for, as above remarked, the preglacial valleys must have mouthed at the outer rim, and, gradually rising, it should extend a good distance inland.

Long-lasting abrasion would completely truncate all but the largest atolls, and completely remove all but the largest barrier reefs. A central island that was surrounded by a narrow barrier reef in preglacial time, would in this case lose all of its reef, and would have a platform abraded in the volcanic rocks all around its border, so that the mountain spurs would all be cut off in cliffs; at the same time the streams would erode open valleys; and these, when drowned by the rising sea, would form open bays, the sides

[26] The term, contraposed, has been lately suggested by Clapp (*Mem. 13*, *Dept. of Mines*, *Geol. Survey Branch*, Ottawa, 1913) to designate a shoreline on resistant rocks that have been laid bare by the removal of the weaker deposits that once lay in front of them. Many examples of locally contraposed shorelines are found along the New England coast, where the abrasion of drift has laid rock ledges bare. Contraposed shorelines thus correspond to superposed rivers.

of which would be but moderately precipitous up to a rounded "edge" or shoulder, above which the preglacial spur slopes were not encroached upon by the new valley. The lagoon waters would rest against the spur-end cliffs, from which the talus might not yet rise from the drowned cliff base to sea-level. In case it be supposed that the total period of lower sea-level was long enough for the mature widening of the deepened valleys, so that all traces of preglacial forms were undercut and destroyed, then the spur-end cliffs should be cut so far back as to become conspicuous features.

It is not possible to say definitely at present whether actual forms, fully corresponding to either of these groups of deduced forms, occur or not; but it may be suggested that if the forms of either group were of general occurrence, their details would probably have been noted. As far as large-scale charts suffice to show the facts, the embayments that prevail in the central islands of barrier reefs are wide rather than narrow, yet the spurs are not shown to be cut off in cliffs; their ends usually taper down and disappear gradually beneath the lagoon waters. The excellent model of Bolabola, a typical barrier reef island in the Society group, made from personal observation by G. C. Curtis for the Museum of Comparative Zoology at Harvard University, gives no indication of two-cycle valleys or of cliffed spur-ends.

It is, however, possible that the cliffs of the Marquesas Islands, situated where the cold waters of the Humboldt Current have just become warm enough for coral growth, but where coral reefs are to-day scanty or wanting, may be explained by an early extinction of corals at the beginning of the glacial period, by the abrasion of the reefs and energetic cliff-cutting during the lower stand of the sea, and by the failure of corals to re-establish themselves on the cliffed shore line in postglacial time. On the other hand, no case of the opposite kind, namely, a broad reef with a very shallow lagoon or no lagoon, in the warmest part of the Pacific, as an example of a reef on which the corals were not killed, and which was therefore not truncated during the lower stand of the sea, has been safely identified; and this is the more adverse to the present theory, when it is recollected that the corals of the Paumotu atolls, south of the Marquesas, appear to have survived the refrigeration of the glacial period, as above stated; and hence that they and many other reefs of the warmer ocean, farther westward, ought, according to this theory, to have very shallow lagoons or no lagoons, instead of lagoons of ordinary depth, such as they actually possess.

Inasmuch as some lowering of sea-level during the glacial period is not to be doubted, although the amount of lowering is uncertain, and inasmuch as one or the other group of consequences of such lowering, as deduced in the preceding paragraphs, ought to be repeatedly and consistently found in actual coral reef islands, we seem to be left in a quandary when, on recourse to the facts as far as they are now known, it appears that neither group of deduced consequences is verified. A partial escape from the quandary may be found by rejecting the postulate that the corals of most reefs were killed by the colder ocean waters of the glacial period—it being remembered that good warrant for such rejection is given by the occurrence of uplifted limestones in the Paumotus and other island groups; for then the reefs would have been protected from abrasion and the ends of the spurs would not be cliffed: but signs of two-cycle valleys ought in this case to be found on some islands.

Another escape from the quandary is found by rejecting the postulate of still-standing islands, and by combining the essential elements of the theory here under discussion with the second earlier theory—Darwin's theory of subsidence—whereby the consequences of a lowered sea-level would, in nearly all islands, be lost by submergence, unless exceptional instances of pauses in subsidence allowed the effects of lowered and raised sea-level to stand forth alone, just as a pause in subsidence has allowed the growth of deltas around Tahiti. If the two theories were thus combined, the present theory would, geologically considered, take rank as a subordinate complication of Darwin's theory, like brief still-stands or temporary uplifts; but it would be of little import geographically, because its consequences would be so generally invisible.

Review of the Preceding Discussion. One result of the preceding discussion is, to the present writer, more surprising than any other; namely, the relative indifference shown by many investigators of the coral reef problem, to the deduction of unexpected consequences from the theories that they announce, and, as a corollary of this, the incomplete confrontation of deduced consequences with appropriate facts as a means of testing the value of the theory from which the consequences are deduced. It would therefore seem that some other method of investigation than the one set forth in the introductory pages of this essay must have been satisfactory to these investigators, but what this other method may be does not clearly appear.

Surely all investigators must recognize that observation alone

will not suffice to discover the origin of coral reefs, and that recourse must therefore be had to speculating on past possibilities, to imagining unseen processes, to inventing hypothetical explanations, in the hope of thus coming upon the mental counterparts of past verities in the formation of coral reefs. Indeed, the very fact that different investigators have announced different views should make it clear that appeal must be made to some decisive method of testing the different views or hypotheses or schemes that have been suggested; and as far as I have been able to penetrate the matter, there is no other way than the one above indicated:—the careful deduction of all possible consequences from each invented theory, the fair-minded confrontation of the several sets of consequences with the appropriate facts, and the impartial judgment as to the success of the confrontation. It has been in accordance with this plan that a careful search has been made, as above set forth, for all the consequences of every theory of coral reef, with the result, as already stated, of more or less definitely excluding certain theories, and of more or less definitely establishing certain others. Yet, evidently enough, a much less elaborate method of investigation has been sufficient to convince many observers of the correctness of their inferences, which, as here analyzed, seem unsatisfactory.

But it is not only exploring investigators of coral reefs who have been satisfied to accept theoretical explanations on what are here regarded as insufficient grounds. Various home students of this problem have also been willing to accept or to reject one explanation or another for similarly insufficient reasons. Thus after the theory of outgrowing reefs on still-standing islands had been announced, various writers gave up the previously accepted theory of upgrowing reefs on subsiding islands without asking for any test —such as drowned valley embayments or peculiar biotic relations —by which a discriminating choice might be made between the two theories. Again, on the discovery of a new cause of change in the relative attitude of land and sea, such as is provided by the withdrawal of ocean water to form the continental ice sheets of the glacial period and the return of the water on the melting of the ice sheets, this new cause was, by some, taken as substitute for the previously suggested cause of change of level as provided by subsidence of the ocean bed, yet again without the presentation of decisive tests that should exclude the earlier and confirm the later suggestion, and without asking whether a combination of both causes acting together would not provide a better explanation of the total phenomena than could be secured through either cause

acting alone. It is therefore quite as much on account of diversity in method of discussion as on account of difference of emphasis placed on divers facts, that the coral reef problem has been differently solved by different students.

Another result of the preceding discussion is also significant; namely, that the conscious and critical examination of the various theories of coral reefs can lead to the deduction of certain essential consequences of each theory which must be the counterparts of the facts if the corresponding theory be correct, and yet which have not, as far as one may judge by published articles and reports, been consciously enough in the minds of those who proposed or adopted a certain theory to lead them to state whether these consequences are confirmed or contradicted by the facts. Thus certain observers of uplifted reefs, who have preferred the theory of still-standing outgrowth to the theory of subsiding upgrowth, have not reported whether the uplifted reefs that they have observed possess a structure of one kind or another; they have not even stated whether the reefs rest on a non-dissected volcanic slope, as the theory of still-standing outgrowth demands, or whether they lie upon an eroded volcanic slope, as the theory of subsiding upgrowth equally demands; and thus they have failed to present to their readers some of the critical tests by which the rival theories can be discriminated. Other observers of barrier reefs have not, whatever theory they adopt, reported whether the embayments of the central island occupy valleys of normal erosion or graben due to volcanic engulfment. In the absence of statement concerning these critical facts, safe judgment cannot be reached.

The evident moral of all this is that an outline scheme, which in its first invented form gives a general explanation for the things that it was invented to explain, must be systematically extended by the mental process of deduction until it includes all the imaginable details in the series of events that it involves; in short, until it shall give a complete historical account of all correlated phenomena within the region under investigation. Only after the outline scheme is thus filled out will an observer on the ground be able to test it by comparing its unexpected consequences with previously unnoticed facts. Indeed, only after the observer is thus led to direct his attention to the occurrence or non-occurrence of certain significant facts will he be able to certify whether such facts occur or not; "for there," as Playfair so well said, "the clue of theory is necessary to direct the observer:"—not to direct him to see the

desired facts whether they exist or not, but to direct him to see whether or not they do exist. This moral is indeed so evident a corollary of the method of investigation here adopted, that its omission, by many students of coral reefs, emphasizes the conclusion above noted, to the effect that for them some other method of investigation must have seemed sufficient. Indispensable as the method of investigation here outlined is to those who follow it, familiar as it is to those who know it, it is perfectly clear that not this, but some other method, has been employed by all students of the coral reef problem.

Summary of Results. Ignorance concerning important structural details of most coral reefs will probably continue for centuries to come. Even if a few selected reefs are perforated by many deep borings, so that their structure is well determined and their origin demonstrated, it will not follow that all other reefs are of the same structure and origin. Hence all that can be hoped for in the way of a solution of the coral reef problem—or of any similar problem—is a high probability of correct explanation, in which the inferences that are strongly supported by closely studied reefs may be fairly extended to other similar but less studied reefs. In a comprehensive theory which embraces fringing reefs, uplifted reefs, barrier reefs and atolls, it may well be that the evidence on which the finally accepted theory is supported is based more largely on uplifted reefs and barrier reefs than on reefs of the other two classes. With regard to the origin of one of these classes, fringing reefs, there is general agreement, for all theories begin with fringing reefs; but the origin of the other class, atolls, must remain only indirectly inferred. At the same time, however successful any one theory may be, it would be unreasonable to exclude all operation of other less successful theories, which may in special cases provide supplementary explanations for peculiar features. Furthermore, however many subordinate modifications are introduced, they will not lessen the value of a primary principle, but merely embroider secondary complications upon it, in the same way that the attractions of the planets cause minor perturbations in the earth's orbit, of which the general form is controlled by the dominating attraction of the sun.

Although atolls are more numerous than barrier reefs, the two forms appear to be so related to each other, and both appear to be so closely related to fringing and to uplifted reefs, that no theory can be accepted for any one of these forms which does not, under proper conditions, reasonably account for the others as well. As

to fringing reefs there is no difficulty: they are begun by colonizing coral larvæ on any new shore line where proper conditions for coral growth are offered. As to uplifted reefs, it is only necessary to add elevation to the previously acting processes of accumulation; but so few details of their structure have been reported that proof of their origin, other than as narrow fringing reefs, is not at present forthcoming.

As to atolls, so much of their under-structure is unknown that full confirmatory evidence of any theory of their origin will be difficult to secure: conclusions regarding them will be derived chiefly from reefs of other kinds. Apart from the close study of uplifted reefs and from deep borings which might reveal the structure of large barrier reefs, it is chiefly from the central islands within reefs of the latter class that independent evidence may be secured, confirming or contradicting any theory by which such reefs are to be explained; for no general theory of coral reefs can be accepted which does not account for the associated features of the central islands within barrier reefs; particularly for the features of their shore lines, and for the biotic relations of neighboring islands, as well as for the structure of the reefs themselves.

Only two of all the theories above considered can account for the embayed shore lines of the central islands and for their biotic relations as above indicated. The eighth theory, which relates a recent upgrowth of new barrier reefs on the truncated platform of earlier formed reefs to the rise of sea-level after its depression during the glacial period, will account either for narrow embayments between tapering spur ends on the central islands or for wide embayments between cliffed spur ends, and also for recent biotic relations of neighboring islands that are separated by shallow water passages: but it will not account for wide embayments between tapering spur ends or for biotic relations of remote origin on neighboring islands separated by deep-water passages. On the other hand, the sixth theory, which relates the upgrowth of barrier reefs to a general subsidence of their foundation, will very satisfactorily account for wide embayments between tapering spur ends and for biotic relations of remote origin on neighboring islands separated by deep-water passages. Hence the theory of subsidence appears to be the most successful of all the theories that have been here discussed. It may be modified so that, while retaining the dominant factors of the original theory, it will include certain subordinate factors derived from other theories, such as outgrowth on certain islands during temporary still-stands and

abrasion on certain islands at a lower level during the glacial period; but subsidence will still remain dominant. Surely a pause in a long subsidence, and the accompanying outgrowth of a reef with the correlated forward growth of deltas in the previously drowned valleys on a single island, would not invalidate the generality of subsidence elsewhere indicated by the absence of deltas and the occurrence of unfilled embayments in the central islands of nearly all barrier reefs. Oscillations of sea-level must have occurred in consequence of changes of climate during the glacial period, and their effects must be looked for; but in view of the facts as now reported, the oscillations are best regarded as small changes superposed on a dominating subsidence. The abrasion of a platform around a volcanic island and the subsequent growth of a veneering reef on the outer border of the platform is easily conceivable, but it does not seem to have been an actual process on islands that are not rimmed around by cliffs. The development of a new barrier reef by the wearing down of a previously formed and uplifted mass of coralline limestone sets the origin of such a mass back into an earlier period of time, when, if it surrounded an eroded slope, its formation in the sea must have been preceded by submergence of the eroded land surface: but more must be learned of the structure of uplifted coralline limestones on the flanks of volcanic islands before their origin can be safely determined. Subsidence still seems to be the dominating factor.

The home study of coral reefs—or rather the home study of the reports of observers who have seen coral reefs—therefore reaches, as here set forth, the same general conclusion that has been reached by several investigators who, living in Australia or New Zealand, recently have had occasion to examine the not distant reefs of the Pacific; for these investigators also attribute a dominating importance to subsidence.

The home study of coral reefs has, however, a special bearing to which reference has not yet been made: it is the best preparation that one can make for the observational study of coral reefs; and it is chiefly with that object that the home study of coral reefs here set forth has been undertaken.

PRELIMINARY REPORT ON THE RECENT VOLCANIC ACTIVITY OF LASSEN PEAK*

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CONTENTS

Introduction

The recent formation of a new crater on the old cone of Lassen Peak is, so far as the writer knows, the first recorded instance of undoubted volcanic activity actually witnessed within the limits of the United States, if territory not contiguous be excluded. It is not surprising, therefore, that both popular and scientific interest have been greatly aroused as to the nature and extent of the real changes which have taken place. At first it was difficult to secure reliable reports, for the region about the mountain is sparsely settled, and this year, on the date of the first eruption, May 30, the snow was still very deep, obscuring all roads and trails as low down as the six thousand-foot contour line. On account of the unusually late season, the summer influx of cattlemen, lumbermen and campers had not yet begun; probably the nearest occupied house was at least eight miles distant in an air line from the mountain top. The inhabitants of the neighboring region were unfamiliar with volcanic phenomena and very naturally observations from stations ten to fifty miles distant resulted in the first reports being conflicting and confusing.

Considering all these circumstances, it seems advisable to issue

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this preliminary report even though at this date it is necessarily incomplete, and even though the probability may be strong that the eruptions have by no means ceased.

Geographic Relations

Lassen Peak is in the southeastern part of Shasta County, in northern California, about two hundred miles from San Francisco. According to the Lassen Peak topographic sheet (a reconnaissance map surveyed in 1882-84), the mountain is 10,437 feet in elevation and is approximately in latitude 40°30′ N. and longitude 121°30′ W. The immediate region lies on the extreme southwestern edge of that great Tertiary lava flow some 250,000 square miles in extent which covers not only northeastern California but portions of Oregon, Washington, Idaho, and Nevada.

In general, geographers consider Lassen Peak as marking approximately the southern end of the Cascade Range, and as being the last of that series of great volcanic cones of which Rainier, Adams, Hood, Three Sisters, Pit, Mt. Mazama, and Shasta are familiar examples. To the southeast of Lassen is the topographic gap of the Feather River separating the Cascade Range from its correlative, the Sierra Nevada, which extends four hundred miles farther to Tehachapi Pass but whose lofty peaks owe their height primarily to uplift rather than to volcanic upbuilding.

Past History

The southern fifty miles of the Cascade Range extending northwesterly toward Shasta from the North Fork of the Feather River is a great volcanic ridge, about twenty-five miles wide, studded with numerous minor volcanic cones and culminating in Lassen, the dominating peak, guarded by a half dozen other major cones which rise to heights varying from seven thousand to nine thousand feet above the sea. Past volcanic phenomena of the Lassen Peak region in recent geologic time have been made familiar to readers through J. S. Diller's well-known report,[1] which describes with considerable detail the Cinder Cone, ten miles northeasterly from the main peak, from the base of which the latest lava flow issued. Until the present outbreak, despite our knowledge of the Cinder Cone lava flows, it has been tacitly assumed in physiographic literature that Lassen Peak belonged to the class of extinct volcanoes, although the following statement by Diller in the folio just quoted shows clearly that twenty years ago he recognized the possibility of renewed eruptions.

1 Lassen Peak Folio, U. S. Geol. Survey, 1894.

"The volcanic action which has built up Lassen Peak with its many associative cones is comparatively recent. It began at the close of the Ione epoch and occurred most violently at the time the Sierra Nevada was upheaved, but it has continued spasmodically to the present time . . . . The latest volcanic eruption in the Lassen Peak district, and possibly the latest in the United States south of Alaska, occurred at the Cinder Cone about two hundred years ago. Some of the trees killed at the time are still standing. The lava, although very viscous, spread more than a mile from the vent and formed a huge tabular pile which extends across a little valley. The lava dam thus formed developed Snag Lake, which contained stumps of some of the trees drowned at the time the lake originated.

"That volcanic activity is not yet extinct in the Lassen Peak district is shown by the presence of numerous solfataras and hot springs. At Bumpass's Hell, near the southern base of the peak, there are boiling mud pools and vigorous solfataric action. Near by, at the head of Mill Creek, the sulphur deposited by such action is so abundant that attempts have been made to mine it. Similar phenomena occur in Hot Spring Valley and at Lake Tartarus and the Geyser, near Willow Lake. The Geyser is much less vigorous than formerly, and now the column of water rises scarcely a foot above its pool."

Present Volcanic Activity

The present volcanic activity of Lassen Peak began the latter part of May. Prompt investigation of the real condition of affairs is due to the fortunate fact that the mountain is included in the Lassen Peak National Forest and that the United States Forest Service[2] had built a fire lookout station on the topmost crag of Lassen Peak itself. The headquarters of the Forest Supervisor, Mr. W. J. Rushing, are in Battle Creek Meadows, near Mineral post office, a little more than ten miles in an air line from the top of the mountain. The lookout house on Lassen and the other stations also are connected with the Supervisor's headquarters by the government telephone lines which extend to the town of Red Bluff, nearly fifty miles to the westward, giving direct communication with San Francisco. When the eruptions began the fire lookout station on Lassen had not as yet been occupied for the summer season of 1914, but it was the property of the Forest Service and a station of special importance. It will be seen that the

[2] The writer is glad to express his appreciation of the assistance and courtesies extended him in connection with his field work not only by District Forester DuBois, of San Francisco, and Supervisor Rushing, of Mineral, but also by various members of the staff in each place.

interests and resources of the Forest Service as indicated above were such that reports of volcanic activity on Lassen were investigated at once and definite records kept of the reports brought in to headquarters. The newspapers of June 2 gave to the general public its first intimation of the volcanic outbreak. As Lassen is visible from fifty to sixty miles in all directions to places favorably situated, the reports of the same eruption seen from different points of view were frequently contradictory. In some of the accounts flames and molten lava were graphically described and such startling reports were either still further exaggerated or the entire occurrence unduly discredited according to the temperament of the reader. The continuation of these reports finally convinced the public that unusual phenomena of a volcanic nature were taking place on the mountain, but it was a difficult task to sift and correlate the various accounts published. Earthquake shocks were reported in some of the earlier eruptions, especially from the region to the eastward of Lassen Peak. Later eruptions were apparently entirely free from seismic disturbances. The following extracts from the report of Forest Supervisor W. J. Rushing to the District Forester at San Francisco, made June 9, give the best summary yet available of events up to that date.

LASSEN—SUPERVISION.

MINERAL, CAL.,
June 9, 1914.

District Forester, San Francisco, Cal.,

DEAR SIR:—Such wild stories are being circulated concerning Mt. Lassen that I am sending you the results of our observations to date.

Saturday, May 30, the first outbreak occurred at 5 P. M. This was witnessed by Bert McKenzie, of Chester, who was looking directly at it when it occurred. Ranger Harvey Abbey investigated it Sunday, May 31, finding a hole 25 x 40 feet in size and of unknown depth. Sand, rocks as large as a sack of flour, and mud had been ejected. The heavier material was thrown over an area three hundred feet across, while the ash, or cement-like material, was scattered over an area one-quarter mile across. . . . No molten material was thrown out at all.

8:05 A. M., June 1, a second outburst occurred, throwing out large quantities of the same material. Some boulders weighing all of a ton were thrown out. The vent was enlarged to 60 x 275 feet. . . . Boerker, Abbey, and Macomber went up June 4, remained on top at the lookout house over night, and came back June 5.

June 8 heavier volumes of steam were noted, and at night apparently another eruption took place, throwing out more ashes or fine material, which could be seen on the new snow.

Heavy volumes of steam are coming out of the vent to-day. We have watched it carefully and at no time have we been able to see any flame or indication of fire. . . .

The vent is about one-quarter mile from the fire lookout house, and if it continues eastward, as it has so far, it will finally break out on the east side.

No damage has been done to the house yet, and if the action does not become more violent will not prevent a lookout occupying it.

Very truly yours,

(Signed) W. J. Rushing,

Forest Supervisor.

Mr. Ben Macomber, one of the party mentioned in the report above as spending the night on the mountain top, has given the following description of the crater as it was after the early eruptions:

When I saw the new crater on Lassen on June 4th and 5th the vent, by an engineer's tape, measured 275 feet long. It was then in one of the pauses between the heavy explosions. Thick volumes of steam, laden with sulphur smoke, were rising, and cracks were appearing in the ground. From three different places on the edge I looked down into the crater. Sixty or seventy feet down a pile of rocks was visible in the center of the vent, but at either end was a huge dark hole from which the steam clouds poured. The walls were absolutely perpendicular and around the top were hung with huge icicles formed by the condensation of steam in the chill air of the peak.

On the west side of the crater everything was buried beneath a heavy fall of light gray ash, into which we sank over our boot-tops. So light was this rock powder that it flew into the air at every step. On the east side the same material seemed to have been thrown out in the form of mud and lay frozen hard as rock. What little snow remained near the crater was buried under a layer of stones and boulders. The larger boulders had sunk down into the snow, creating many treacherous pits.[3]

Experiences near the Crater during Eruptions

An interesting series of eruptions occurred June 12, 13, and 14. On Friday, the 12th, Forest Ranger Abbey and a party of five were "climbing upward half a mile from the crater, when with a great roar the mass of ashes and boulders shot into the sky above." Immediately stones began to fall about them, and three hundred-pound boulders began to drop a short distance above and bound down the mountain side toward them. The party ran to shelter behind a point of rocks on the ridge. Milton A. Ayres, the San Francisco moving picture operator, alone faced the storm. Setting up his machine on a boulder, he began to turn the handle. That night he told the story of his experiences at the volcano.

We had no warning. The roar and the uprush of the black mass above were simultaneous. The rocks began to fall on the mountain side; the gases did not come our way much, as the wind drove them to the east, but we got some strong whiffs of sulphur smoke. For the same reason little ash fell where we were. . . . .

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[3] *San Francisco Chronicle*, June 28, 1914.

Later we went on to the summit, reaching it at 6 P. M., two hours after the eruption began. We found the whole mountain top strewn with great boulders and heavy ash. No one could possibly have lived at the top while the outburst was on. We climbed up to the shelter house, where we had expected to spend the night, and found it in ruins. Boulders had crashed down through it and splintered the building to kindling wood.[4]

On the way down the next morning another eruption took place at 6 A. M., lasting thirty minutes, during which ashes fell at the headquarters of Forest Supervisor Rushing.

The eruption of June 14, the third day of this series, was the heaviest yet reported. The only injuries suffered by visitors to the crater occurred in the outburst beginning about 9:45 A. M. On that morning a party of eight were climbing the mountain from Manzanita Lake.

They reached the crater in safety, looked down upon it, and, noting the heavy outpouring of steam and smoke that boiled up between the three peaks that mark the ruined walls of the ancient crater, decided to get away as quickly as possible. They were too late; hardly had they gone a quarter of a mile from the crater when the black mass of rock and ash rushed up from the crater with a mighty roar and stood high above them. They ran in terror before the awful threat, but there was no refuge. With a crash the hail of rock fell upon them. At the same moment the storm of ash came down with midnight blackness. As the men ran down the slope they lost each other in the darkness. When the survivors came out of the storm and met below the line of rock and ash four men were missing. For two hours explosion followed explosion in one continuous crash.

In the rest of the dispatch one of the party, Lance Graham, was reported to have died of his injuries. Later reports stated that he was found unconscious, and was later left for dead, but he was finally taken down the mountain side and is now reported convalescent. He was severely injured, the bones of the shoulder being broken and the flesh badly bruised. The other men temporarily lost finally reached camp in safety. Considering the difficulty of getting accurate accounts, especially when in most cases there necessarily was repetition in transmitting the news, it is not surprising that the first accounts contained many inaccuracies. The portions quoted were selected because subsequent events showed them to be practically correct, although an inspection of Figure 4 does not justify the statement that the fire lookout house was splintered to kindling wood. The quotations, however, undoubtedly fail to give a correct impression of the grandeur of the phenomena or of the terror which they must have inspired in the observers within the danger zone.

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[4] *San Francisco Chronicle*, June 14, 1914.

The best pictures of Lassen Peak taken during an eruption are possibly those obtained on the morning of June 14 by Mr. B. F. Loomis. Four of these photographs are reproduced in Figure 7, showing successive phases of the eruption. A letter from Mr. Loomis came after this paper was finished, but the major part of it is inserted here because of its great interest, even though some newspaper accounts of the same events have already been given.

VIOLA, SHASTA CO., CAL.,
July 13, 1914.

Mr. R. S. Holway, Berkeley, Cal.,

DEAR SIR:—Yours of the 3rd inst. is just received, in which you ask me to say a few words in regard to the eruption of Mt. Lassen. It affords me pleasure to comply with your request, as I know the information will be used for educational purposes.

Viola is situated about ten miles west of Mt. Lassen, and as I have climbed to the top of the mountain three times since the first eruption on May 30th I am fairly familiar with conditions as they exist there.

We had been camped on the road two days waiting for an eruption to occur, with camera focused and trained on the mountain all ready to begin taking pictures at a moment's notice. Mrs. Loomis enjoys landscape painting, and to get the colors properly it was necessary for her to witness an eruption. About 9:45 Sunday morning, June 14, our vigilance was rewarded with success. I saw the smoke ascending from the crater the moment the eruption began. I ran to the camera, put in a plate holder and exposed, getting what we call photo No. 1. Then I changed the plate holder and exposed again as quickly as possible, getting photo No. 2. At this time a wonderful phenomena occurred. The heavy ashes contained in the column of smoke, its momentum being spent, began falling downward and flowed down the sides of the mountain, then rolling up in immense clouds of black smoke. This is slightly noticeable in photo No. 2. At this juncture I exposed again, getting photo No. 3. The wind was from the south, which blew the smoke to the left from my position and away from the top of the butte; then another cloud shot upward, when I exposed again, getting photo No. 4. These clouds of black smoke were so dense that they seemed to stand up like a mountain of granite in a solid mass. The sight was fearfully grand. The cloud was moving rapidly toward the north, when I soon got photo No. 5. These first photos were taken with a telo-photo lens, 14-inch focus, and later, when the cloud of smoke was all spread out, I got photo No. 6, this being made with the combined lens with 8½-inch focus, the size of the plates being 6½ x 8½.

This eruption of June 14th was the ninth eruption, and the time between photos No. 1 and No. 6 was about twenty minutes. These eruptions sometimes appear as a puff of smoke and ashes, and at other times they continue for about half an hour. The distance from my viewpoint to the top of Mt. Lassen is a trifle over six miles, according to the geological survey.

But in the midst of my enthusiasm in making the pictures I could not help thinking of those men who I knew must be near the mountain. Were they safe? Mr. R. E. Phelps and his mill crew, ten men in all, were camped at Manzanita Lake the night before. They struck camp early in the morning to climb the

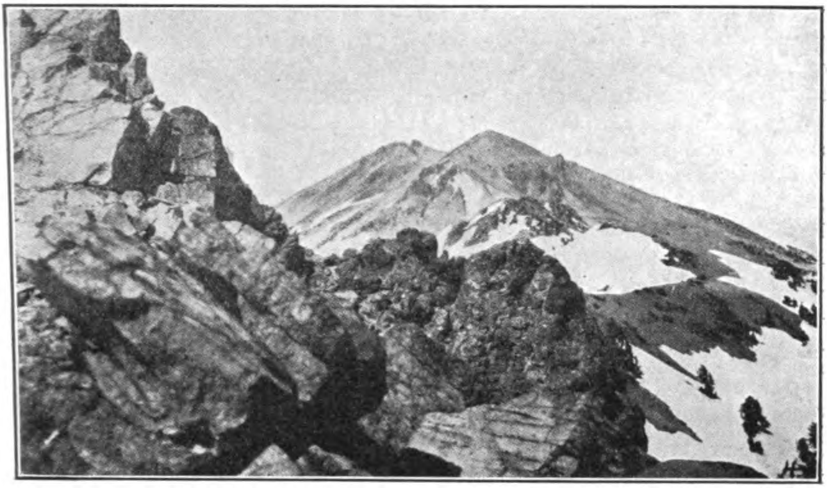

Fig. 1—Lassen Peak from the southwest. This view, showing the upper fourth of the mountain, was taken from a peak about three miles distant and approximately 8000 feet in height. The two minor peaks at the top are the ends of two eroded ridges, the remnants of the walls of the ancient crater.

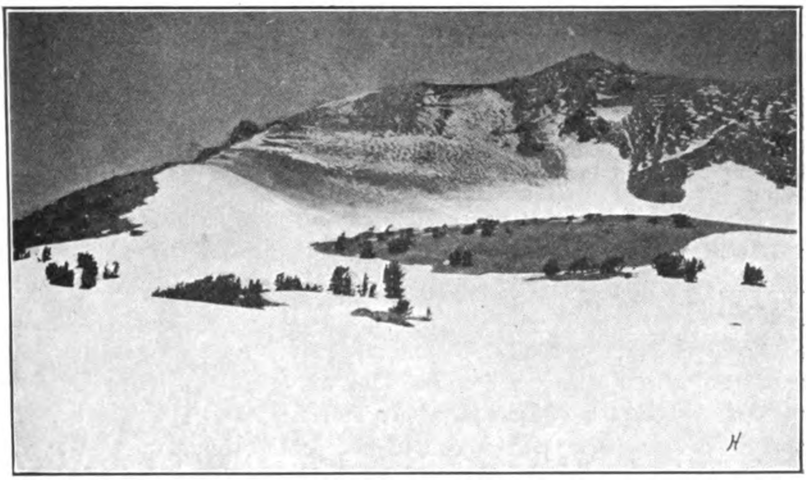

Fig. 2—Limit of falling ash not wind-borne. The viewpoint was at an elevation of about 8500 feet on the south slope of Lassen Peak. A slight fall of new snow partially obscures the ash. June 28, 1914.

mountain to look at the crater. They went up on the north side right under where the heaviest smoke and ashes fell. Another party of five men also left the lake at 8 o'clock on the same mission. Mr. Phelps' party had just reached the rim of the old crater and sat down to rest a short time, watching the smoke from the crater, when the eruption began. Without any warning or explosion that could be heard, a huge column of black smoke shot upward with a roar, such as would be caused by a rushing mighty wind, and in an instant the air was filled with smoke, ashes and flying rocks from the crater. They all ran for their lives. Mr. Phelps hid under an overhanging rock, which sheltered him from the rocks which brushed past him as they fell. Lance Graham was a few feet away and was struck by a flying rock, which cut a great gash in his shoulder, piercing the thoracic cavity, and broke his collarbone. He was left on the mountain for dead, for a time, but was afterward removed with great difficulties, and is now recovered. Jimmy Riggins, another of their party, ran down the mountain and, coming to a snowdrift, slid down the mountain like a shot. The cloud of smoke kept pace with him, and when he reached the bottom of the snowdrift he found a clump of bushes and, diving into it, buried his face in the snow to keep out the blinding smoke and ashes. The smoke is described as causing the blackest darkness, black as the darkest night. If it had lasted much longer some of them would have been smothered.

One peculiarity is that all the rocks and ashes were cold, or only lukewarm. Had they been hot these men would have been burned to death. Later I learned also that the rocks which fell on the snowdrift inside the south rim of the crater are lying on top of the snow where they fell, the snow being frozen hard when they fell, but they would have melted their way to the bottom had they been hot. This snowdrift is about 600 feet south from the new crater and there are probably a thousand rocks lying on top of the snow where they fell. This snow is covered with about three inches of ashes, which turn black when wet. It is seen in the foreground in my photo of the crater. . . .

Trusting that this brief description will be of service, I am

Very truly yours,

B. F. Loomis.

Condition of the Crater June 26 and 28

The writer's observations were made in the interval from June 21 to 29, between which dates no eruption took place. On the 21st the mountain was approached from Mineral by way of Soupan Springs. During the day a continuous thin jet of steam was being emitted from the crater, but the camera failed to show the steam in the view taken from the peak just north of Soupan Springs, Figure 1. This view shows the top of Lassen as two minor peaks. On reaching the top these two minor peaks seen in perspective from the southwest are found to be two much eroded ridges which are undoubtedly remnants of the ancient crater walls.

From June 23 to 25, rainstorms, with snow on the higher levels, prevented a visit to the crater with any possibility for photographic work. On Friday, the 26th, and Sunday, the 28th, the sky was

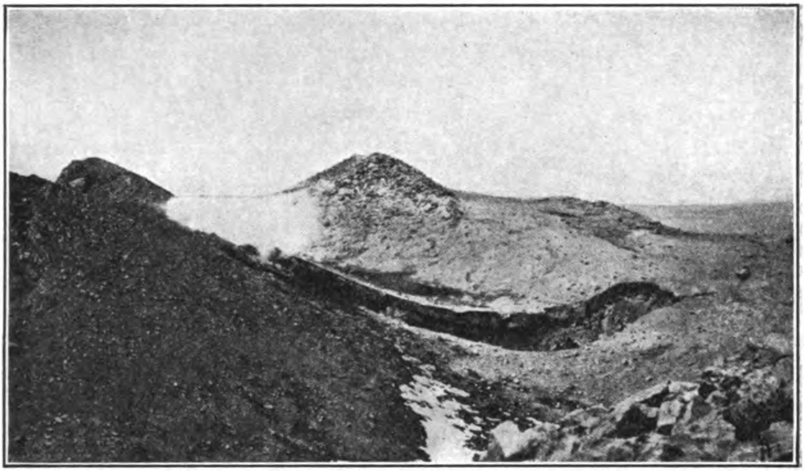

Fig. 3—The new crater as seen June 28, 1914, from the south wall of the old crater. Occasionally puffs of steam came from the right-hand end of the new vent. By pacing, the length of the crater was estimated to be approximately 400 feet.

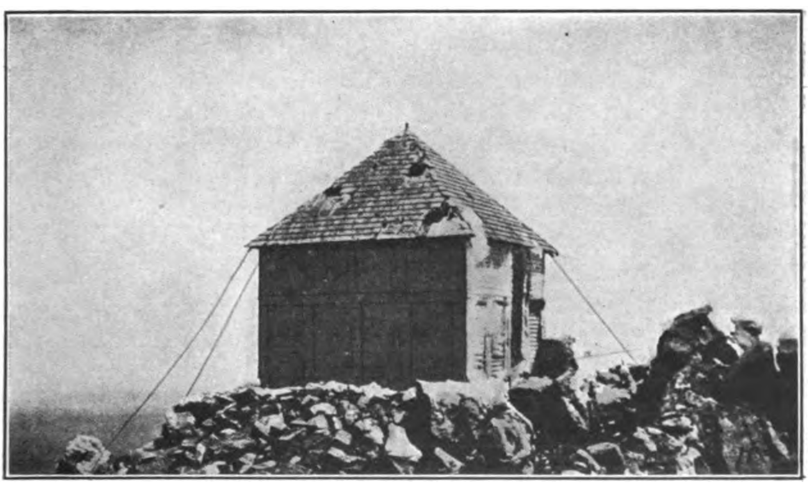

Fig. 4—The fire lookout station of the U. S. Forest Service on June 26, 1914. The holes in the roof were probably made during the eruption of June 14. The house is built on a crag located at the right on the extension of the ridge showing in immediate foreground in the figure above.

clear, and on both those days the actual crater was visited and photographed from various points of view. Both trips were made from the hotel at Morgan as a base. The ride on horseback to the foot of the volcanic cone proper at that time took almost four hours, the latter half being over snow from ten to twenty feet deep. The new crater has frequently been described as being located on the south slope of the north peak. North Peak, however, is merely the northern portion of the walls of the ancient crater. The relations of the new opening to the old volcano are better appreciated by describing it as an opening not in the center, but on the north side of the bowl of the old crater. The central depression of the old crater is probably over three hundred feet below the remaining points of the old rim. The wall of the old crater has been deeply breached both on the east and on the west, and the melting snow in the depression now drains westward, although there is not enough surface water to make any regular channel. The volcanic dust or "ash" from the different eruptions has been reported as falling from ten to twenty miles from the peak, the amount and direction evidently varying with the wind. Figure 2 shows that the limit of the heavy fall of ash not wind-borne was quite definitely marked and was probably within a circle of a half mile. It was not, however, a uniform circle. In making the ascent on June 26, instead of the regular trail a more easterly route was taken, leading up the southeasterly ridge directly to the fire lookout station. This ridge, which lies in the general direction of the longitudinal opening of the crater itself, was found to be much more heavily covered with ash than the regular trail. While the main outburst was directly upward in the eruption shown in Figure 7, irregular streaks of ash such as the one just noted prove that there were minor outshoots of volcanic dust in various directions. Reports of the distance to which stones were thrown seem to have been based upon their being found resting upon the surface of the old snow, but the fact that stones are constantly being dislodged from the cliffs by ordinary weathering processes and are rolling down the mountain side shows the need of additional criteria. To avoid mistaking such stones for those thrown through the air by eruption, careful search was made on level patches of the old snow so located that stones could not well roll down upon them. Wherever such level surfaces were found there was no evidence of ejected stones falling a much greater distance than the lookout house.

The new route taken June 26 in climbing the last two thousand feet of Lassen presents some advantages in studying the mountain

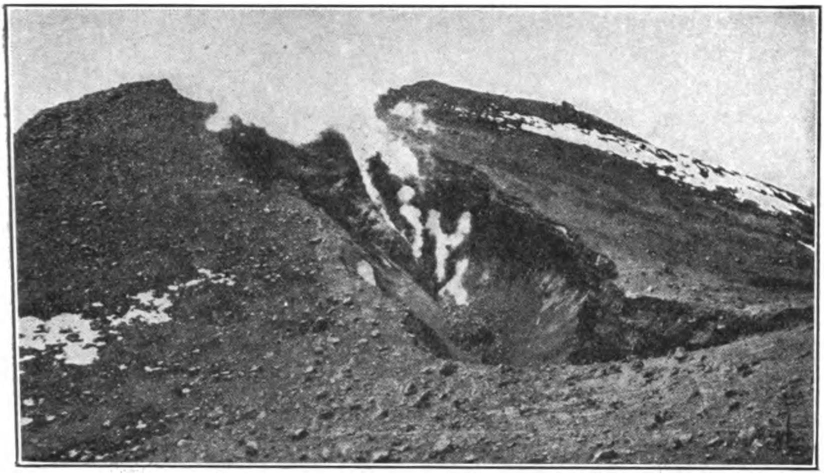

Fig. 5—The northwesterly end of the crater on June 28. Whenever the steam was blown aside, a crack was visible extending in the line of steam jets.

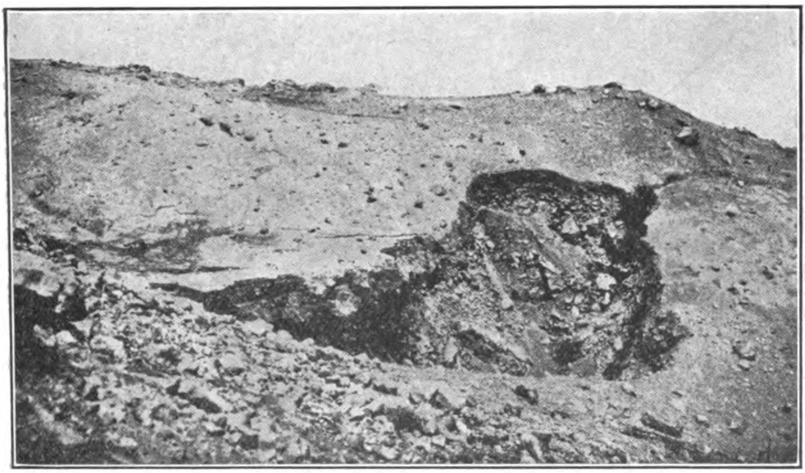

Fig. 6—The southeasterly end of the crater on June 28. The crack leading to the right (partially filled in) extends in the same direction as the general trend of the new crater. See also plate 34, figure 1. The elongated crater and the cracks suggest that the new vent may be an opening along a fault line.

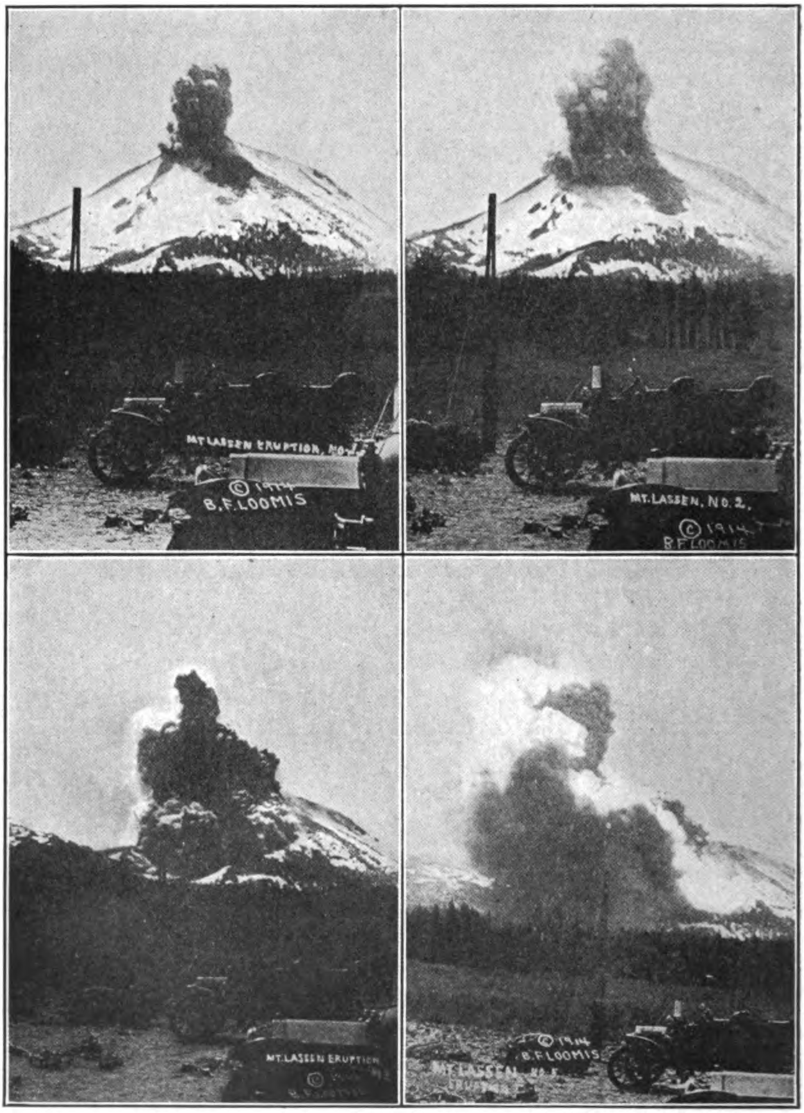

Fig. 7—The Eruption of June 14, 1914.
This series, showing four stages in the eruption beginning at 9:45 A.M., was obtained by Mr. B. F. Loomis, of Viola, from a point about six miles to the northwest at an elevation of nearly 5000 feet. The time interval represented by the entire plate in about fifteen minutes.

in relation to its volcanic activity. To the eastward can be seen the lava field of Cinder Cone and some half dozen other cones, several of them with the craters still well preserved. On reaching

the narrow ridge which leads immediately upward to the fire lookout station, directly below to the northward there is seen an area of barren, burnt-looking rocks suggesting a local outpouring of lava in geologically recent time. The heavy deposit of recent ash through which one walks for the last twenty minutes extends but a moderate distance on either side of the ridge, indicating that this route to the top is directly in the line of fire of the crater above. Nearing the top, the crag upon which the Forest Service station is built becomes so steep and rugged that the final climb is made without any glimpse of what is ahead. As the last rocks are scaled and one stands on the few feet of space by the little frame building bound down to the crag by wire cables, there suddenly yawns below the climber the bowl of the ancient crater, and he looks directly into the irregular naked chasm of the new vent torn in the opposite slope. It is impossible for a camera with its narrow field of view to give correct impressions of the topographic conditions of the mountain top. The observer standing upon that sharp rocky pinnacle is conscious of the steep slopes behind him and, although he narrows his vision to the new crater steaming below, he sees subconsciously the surrounding ragged edge of the bowl of the ancient crater.

Descending into the irregular basin, the new vent was photographed at closer range from various directions. No appreciable change occurred between June 26 and June 28, except the rapid disappearance of the new snow as a result of the warmer weather. The northwesterly end of the new crater, Figure 5, was of most interest because of escaping steam. On close approach the sulphur fumes became oppressive and yellow sulphur deposits near the vents were distinctly noticeable. The crater was apparently being extended longitudinally along cracks at either end. The northern wall showed also a transverse crack running back from the vent more than a hundred feet, Figure 6. The depth of the crater did not seem to be over eighty feet, but the continually caving sides suggested that the present bottom is but piled-up debris. No suggestion could be obtained of the depth of the holes from which steam was escaping. By pacing a line parallel to the side and some fifty feet distant the length of the crater on June 28 was estimated at somewhat more than four hundred feet. This estimate is less than that given by some observers, but agrees closely with that made by Mr. Diller on June 20.[5]

[5] *Science*, Vol. 40, N. S., p. 50.

Evidences of Heat

Reports that the whole upper part of the mountain down to the 8500-foot level, approximately, had been snow-covered and that the snow had been melted by volcanic heat are entirely erroneous. Snow covered by the ash was still to be seen close to the crater and in considerable quantity on June 28. The new snow of June 23-25 was visible in patches on top of the ash, yet by digging through that and through the layer of ash below the old snow was found underneath. In fact, there was no evidence of heat on the mountain top other than the escaping steam. The ejected rocks seemed identical with the old lava rocks still in place on the mountain top. Naturally those ejected from a hundred or more feet below the surface would not bear indication of surface weathering, but there certainly was no rock found having the appearance of being recently fused.

Later Eruptions

The writer left Morgan Springs on June 29, there having been no eruption during his stay, unless minor ones took place at night. Heavy eruptions took place during the next three days and were briefly described as follows by Mr. Rushing in his report dated July 1:

> June 30, 11:06 A. M., lasted until 12:14 A. M. Column ascended 2800 feet.
>
> July 1, 5:30 A. M., lasted until 6:31 A.M. Very heavy eruption. Column ascended over 3000 feet. Heavy volumes of volcanic dust thrown out. No lava, flames, or earthquakes were noticed.
>
> Many wild rumors of forest officers and private individuals being injured or lost are in circulation, but there is no foundation to them, although many people are taking serious chances by visiting the crater.

Since that time until the date that this paper was transmitted for publication there have been reports of other outbursts, as may be seen in the list of eruptions appended.

List of Eruptions, May 30 to July 15, 1914

The greater portion of this list was prepared at Mineral under the direction of Forest Supervisor Rushing, but as additions have been made to bring it up to a later date he should not be held responsible for inaccuracies. Reports of eruptions at night and in cloudy weather are naturally most open to doubt.

No.	Date	Time	Character of	Duration	Size
1	Sat., 5/30	5:00 P.M.	Heavy	10 min.	25 x 40
2	Mon., 6/1	8:00 A.M.	Heavier	15 min.	275 x 60, 60 ft. deep
3	Tues., 6/2	9:30 A.M.	Very heavy	30 min.	
4	Mon., 6/8	4:30 P.M.	Heavier	40 min.	
5	Tues., 6/9	10:30 A.M.	Heavy, steam darker	30 min.	
6	Fri., 6/12	8:45 P.M.	Heavy, steam very dark	50 min.	400 x 100
7	Sat., 6/13	6:00 A.M.	Ashes fell at Mineral, heavy	30 min.	
8	Sun., 6/14	6:00 A.M.	Unconfirmed, reported by Red Bluff	?	
9	Sun., 6/14	9:43 A.M.	Altitude smoke 2500 ft., heaviest yet	30 min.	
10	Sun., 6/14	6:45 P.M.	Medium	15 min.	450 x 125
11	Fri., 6/19	8:15 P.M.	Altitude smoke 2000 ft., medium	15 min.	600 x 150
12	Mon., 6/29	3:00 A.M.	New snow covered by layer of ash	?	
13	Tues., 6/30	11:06 A.M.	Heavy, series of slight eruptions followed first, alt. 2800 ft.	40 min.	
14	Wed., 7/1	5:30 A.M.	Heaviest yet, alt. smoke 5900 ft., as per calculations	50 min.	
15	Thur., 7/2	6:50 A.M.	Very heavy	30 min.	
16	Mon., 7/6	3:30 A.M.	Reported by Red Bluff, heavy, steam and smoke from entire length of crater	30 min.	
17	Sat., 7/11	6:35 A.M.	Light	30 min.	
18	Mon., 7/13	3:00 P.M.	Light	90 min.	
19	Tues., 7/14	6:00 A.M.	Light		
20	Wed., 7/15	12:05 P.M.	Heavy		

Summary

Lassen Peak, an old volcanic cone in a region where a lava flow occurred some two hundred years ago, has exhibited true volcanic activity during the past six weeks. In the bowl of the much eroded old crater a series of steam explosions have opened a new vent, and from it stones have been thrown over an area more than one-half mile in diameter, and ejected volcanic ash has been wind-borne in sufficient quantities to make a perceptible deposit at a distance of fifteen to twenty miles. No freshly molten lava has been seen and no heat has been noticeable, except that of the escaping steam. Sulphur fumes and slight sulphur deposits near the vent have been noticed by nearly all observers.

The source of the heat causing the explosions of steam is a matter of conjecture. It may of course be due to an ascending column of lava working its way up the old vent, but such suggestions are merely speculations, as would be any opinion as to the future activity of the volcano.

July 16, 1914.

MODERN KOREA

By R. MALCOLM KEIR
Department of Geography and Industry
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Physical Configuration

Position. Korea is a peninsula in northeastern Asia. Its nearest neighbors are the Shantung Peninsula in China on the west; Manchuria and Siberia, to which it is joined, on the north; and Japan on the east and south. The Yellow Sea separates Korea from China, but the distance between the nearest ports of each country is only 270 miles, while land projections bring the two regions even closer together. Japan faces eastern Korea across the Japan Sea, but on the south Korea is almost within sight of Japan, for the Korean Straits are but 120 miles across at their narrowest portion. An outlying island belonging to Japan (Tsushima) and lying in the Korean Straits is actually visible from Korea in clear weather. For these reasons Korea, although a peninsula, is close to the lands adjacent to her, and acts as the link which binds them together.

If Korea could be moved laterally without changing her north and south position her northernmost extremity would touch the northern boundary of California, her most southern port would be in the neighborhood of Fresno, Cal., and her capital, Seoul, would coincide with San Francisco. A second move would place the northern points at Chicago, Ill., the southern at Chattanooga, Tenn., and the capital at St. Louis. If we shift the position a third time, Providence, R. I., would mark the north, Wilmington, N. C., would be at the site of Korea's capital. In Europe, Rome, Italy, would overlap Korea's northern border, the southern would be in line with the city of Tunis in northern Africa, and the capital of Korea would be opposite Seville, Spain. In other words, Korea is 600 miles long, extending between the 34th and 43d parallels. Korea's 135 miles of width corresponds to the width of California along the Mexican border, or to Northern Michigan, or Florida, or Italy.

In general appearance and size Korea is not unlike Italy, or resembles a very much enlarged picture of New Jersey. If Florida

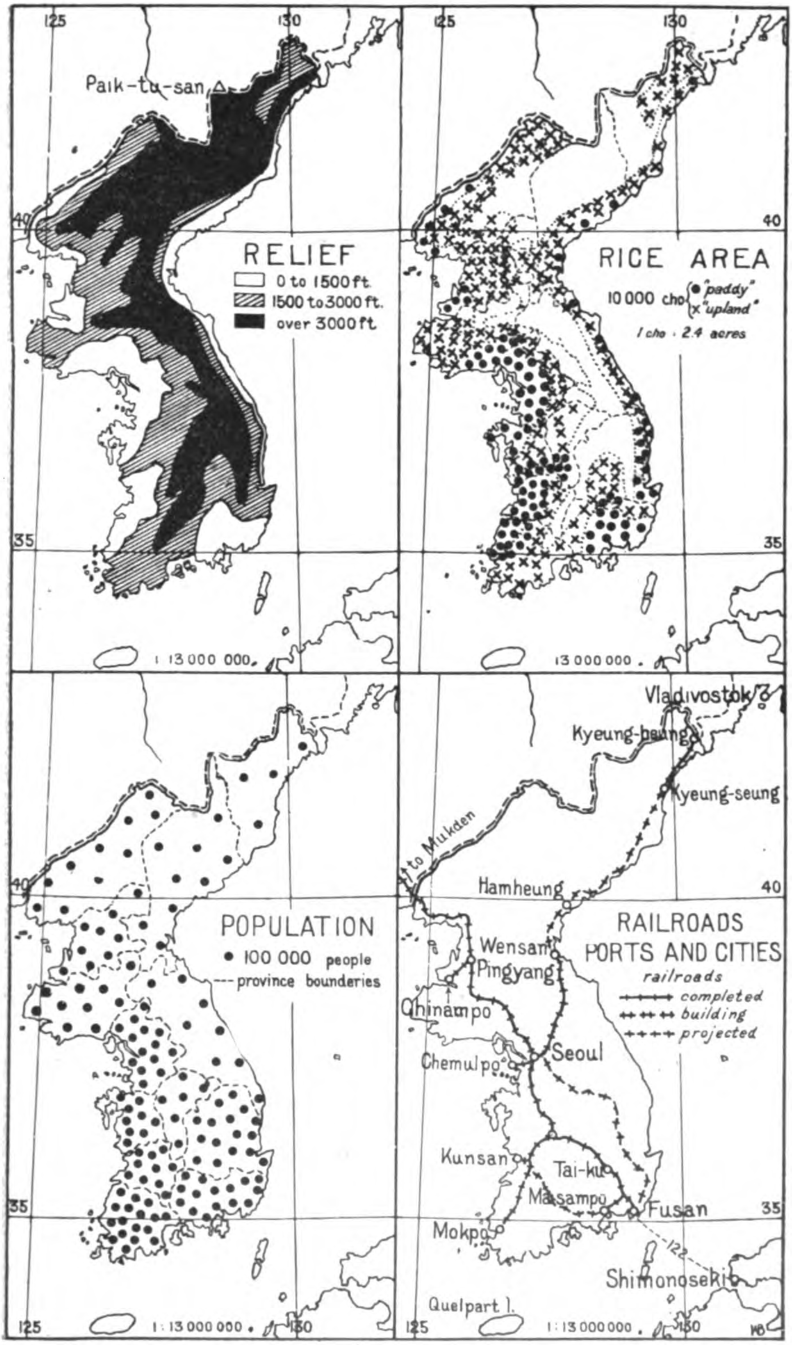

Fig. 1—Sketch maps showing relief, population, railroads, ports and cities, and rice area.

could be reversed so that its northwestern projection would become a northeast extension and then the whole peninsula lengthened by a third it would bear a striking similarity to Korea. The area of Korea, 82,000 square miles, is a little more than half that of California. On the other hand, Illinois is only two-thirds as large, and all New England about three-fourths. England and Scotland together are about equal to Korea, while Italy is one-fifth larger. Korea comprises about one-third of the Japanese Empire, of which it is a part.

Topography. At first glance Korea appears to be all mountains, and, in fact, they cover five-sixths of her territory. The mountains are highest and most completely occupy the country in the north. The highest point, almost in the center of the northern boundary, called by the Koreans Paik Tu San, which means The Long White Mountain,[1] is 8,700 feet in altitude. From this elevation the mountains gradually diminish in height southward, but extend nearly to the end of the peninsula. Beyond the peninsula the system can be traced in a large number of islands that girdle the southern and southwestern shores of the mainland. The backbone of the mountain system is near the eastern coast. On the east the slope is always steep, often abrupt and sometimes precipitous. Therefore on this side streams are short, shallow and rapid, and the coastal plain is a mere fringe. There is only one large river, the Naktong (in the extreme southeast), but even this is navigable only for a short distance for small boats. The western slope is far more gentle, but even it is fairly steep. Consequently in all Korea there are many small quick-flowing streams, but only a few rivers. On the western flank of the mountains, four streams[2] reach the dignity of rivers and are navigable above their mouths for small boats. For the most part the innumerable brooks are useless for power purposes due to the fact that seven-eighths of the rain falls during one short season, when the watercourses are torrents, but throughout the remainder of the year they have a greatly diminished volume. There is only one hydroelectric plant in the entire country.[3]

The main axis of the mountain system does not follow the general north and south trend of the peninsula, but is at an angle N.E.–S.W. across it, with many spurs projecting westward. This favors the distribution of rainfall throughout the whole country during the summer rainy season, for the rain-bearing winds blow

[1] So called on account of its snow cap. [2] Tumen, Yalu, Ta dong, Han. [3] At Gensan.

from the southwest to the northeast. On the other hand, the cold winds from the ice-bound interior of Siberia have free access to all the north and northeastern parts of Korea in the winter. The southern portion is tempered by the all-surrounding water and especially by the nearby presence of the Yellow Sea warmed by the Japan Current. As a consequence the climate of Seoul, the capital, is similar to that of New York, but without the extremes of heat and cold to which New York is subject. In general the arrangement of mountains causes Korea to turn her back to Japan and her face to China, a topographic fact that is reflected in the mental attitude of the Koreans toward her two great neighbors. The many outlying spurs of the mountains and the endless succession of hills and valleys caused one of the first foreigners who visited the country to remark that Korea looked like a gale-whipped sea that had solidified. In the extreme southeast two projections of the mountain system create the two harbors of Fusan and Masampo. Fusan is one of the two greatest commercial ports of Korea. Masampo has been reserved by the Japanese for a naval base and fortification. It is one of the best naturally protected harbors in the world, and is said to be as much superior to Port Arthur as Port Arthur surpasses Gibraltar.

From what has been said regarding the mountain slopes and relative number of rivers it is easy to judge that the eastern coast differs widely from the western. The eastern coast is little broken, has few harbors, and along it are no islands. The water off the shore is deep and the tides small, rarely rising more than two feet. In direct contrast, the western coast is bordered by nearly two hundred islands, and the shore is low, shelving, and abounding in mud banks, formed by the silt gouged from the mountains and carried to the coast by the rapid streams. An interesting theory, well supported by legends and geology, explains the shallowness of the western sea between Korea and the Shantung Peninsula in China on the ground that Korea and China were once united and that the Gulf of Pechili and the Yellow Sea were combined in one huge inland lake. The tides on this coast of Korea reach a height of 20-36 feet. The Chinese take advantage of the difference in tides by running their junks at high water close to shore, propping them up with stakes. When the tide is low, the freight is unloaded on foot, then the junk is reloaded and at high tide is floated away. Sea-going vessels must anchor three miles off shore and transfer their cargoes to lighters. Navigation on the west coast is dangerous, due to the mud banks, the counter currents between the

islands and, at certain seasons, dense fogs from off the Yellow Sea. Yet this is the coast that has the largest shipping and greatest number of harbors in use. Such a condition is brought about because the coastal plain of eastern Korea is too narrow to support a large population and the eastern mountain slope is too steep for agriculture, unless grain could be planted with a rifle, as it is said to be in West Virginia. Therefore in Korea the people live on the more gentle western slope of the country and along the wider western coastal plains. Hence the western sea is necessarily used rather than the eastern, for the high mountain backbone prevents the use of the few excellent eastern harbors with the carriage of goods overland to the people on the west. Furthermore, the Koreans have, until recently, been more closely tied to China on the west by political and social bonds than to Japan on the east.

With mountains covering so large a proportion of the surface, and with a generous rainfall, one would expect Korea to be a well-forested country. At least 73 per cent. of the area ought to be tree-covered, yet Korea is poor in timber, because the trees are given no opportunity to grow. Fuel is scarce and high priced, so the wood is always kept cut to the limit. Weeds, grass, animal and human excrement and kitchen refuse are made to supply the lack of better fuel. There are forests on the Yalu, the northwestern boundary, and on the eastern slope of the mountain ranges, where Japanese woods and our familiar oak, chestnut, willow and pine all grow in varying numbers, but these woods are not now easily accessible or available for most of the population. Lumbering is exceedingly crude, consisting almost entirely of whip-sawing. There is one saw mill at Seoul and another at the Yalu River, but these are small and do not begin to meet local needs. There is a heavy demand for lumber all over Korea. The price for lumber now is almost prohibitive and places it among the luxuries. For building houses the lack of boards is met by the supply of bamboo. The framework is bamboo, which is covered with a plaster of mud. The roof is straw-thatched, so that at a distance even a large city has the appearance of a vast barnyard filled with a grand array of haycocks.

History

The political history of Korea is of commanding interest because of its sublety, Oriental indirection, plots and intrigues. It is necessary to know a few of the important events of the past in order to understand and interpret present conditions or to pre-

dict the future. Although Korea existed as a nation 2,000 years before America was discovered and has a recorded history from 1200 B. C., the first event of modern interest was the invasion of the country by the Japanese Empress Jingo in 1 A. D., which gave Japan her first claim on Korea and awakened a desire in Japan for the possession of Korea's rich rice lands so near at hand. The second invasion occurred in 1592 when the Japanese under Taiko Hideyoshi, actuated only by the love of conquest, overran the peninsula. Korea called upon China for aid, and for eight years China and Japan ravaged the territory, each nation as great a scourge as the other to the helpless country that lay between them. At the end of the war, Korea was well-nigh exterminated. From the ravages of this double invasion she has never recovered. Since then her nobility has been corrupted by intriguing with the two neighbors. The best blood of the land was annihilated and the most skilful artisans carried into captivity. From that time until recently Korea paid tribute to both China and Japan, although China was recognized as Korea's overlord. The war caused Korea to hate all foreigners most bitterly, and she adopted a policy of exclusion, which was not shaken until 1882, when an American treaty opened her ports to foreign commerce. The invasion brought Chinese and Korean arts, culture and civilization to Japan, and supplied the first impetus to her growth among nations. Affairs in Korea remained quiescent until 1868, when Japan began taking steps to gain a more decisive interest. After years of intrigue, China and Japan came to blows in 1894-5 to decide which should be supreme in the peninsula. As a result of the war Korea changed overlords, for China was driven out. But a new figure was added to the contest for the rulership, by the activities of Russia. Japan was denied the fruits of her victory over China, and Korea lent a willing ear to the advice of Russia. The Japanese-Russian war was fought in 1903-4 to decide whose interests were paramount in Korea. At the end of the war, Japan established there a Resident General, who was to advise the Korean Emperor in all his affairs. Since the Emperor was not forced to do more than listen to this advice, Japan formally annexed Korea in 1910, made it a Japanese province, changed its name to Chosen, and began a long series of reforms.

Japan's interest in Korea is easily explained. Japan is situated on mountainous islands with limited resources. She was an agricultural nation, long self-supporting, but of late years her pupulation has increased at the rate of 600,000 to 700,000 a year. Agri-

culture has been pushed to the limit of intensity, but is unable to support the population. Japan has been forced to become an industrial and commercial nation, but she can neither feed herself nor supply the raw materials for her own factories. She cannot add much to her resources by intensity of culture, so must look to new lands. The most available are Korea and Manchuria. Neither of these places is populated anywhere near so densely as Japan and both have the very resources Japan needs, so Japan's attitude toward the two places is perfectly logical and necessary. For the protection of her markets, as a means of sustenance and also to preserve her very integrity as a nation, Japan must control them, for Korea in the hands of a power hostile to Japan would be a veritable dagger pointed at Japan's heart. The chief obstacle Japan has to meet in the development of her new province is the deep-rooted hatred of Koreans for all things Japanese, but this she hopes to overcome. What are the resources and possibilities of the country Japan has been so anxious to possess?

INDUSTRIES

Agriculture. Korea is predominantly an agricultural country. Agriculture is the one great resource, and fully 75 per cent. of the whole population are engaged in farming. Even the few artisans that Korea possesses come from the farming group, and most of the artisans are farmers also. Although the country has rich forests in the north, and notwithstanding the fact that minerals add to her natural wealth, and that the waters off her shores abound in fish, agriculture overshadows all other forms of industry, and is more important than all the others added together. This statement may sound strange when one reflects that the greater part of Korea's area is occupied by mountains. It is true that the territory is lacking in plains, but the jumbled mass of hilly country creates many fertile valleys. The soil in these little pockets is enriched by the silt washed into them continuously by the streams, for each individual valley has its own particular mountain torrent supplying it with both soil and moisture. In addition, the valley alluvium is mixed with disintegrated lava, for Korea was once the seat of active volcanoes.[4] The combination of silt and volcanic ash creates a soil that can hardly be surpassed for fertility. It is an exactly similar soil that has made India so richly endowed in farming, and has enabled her to support such

[4] Paik Tu San is an extinct volcano.

a teeming population. It must be admitted, however, that the Korean mountains do most effectively limit agriculture, for only ten per cent. of the whole land mass can possibly be tilled. Not even that small amount is actually under the plow. It is estimated that the cultivated area is equal to 6,750,000 acres,[5] and that there are 2,000,000 acres in addition that are fit for farming but are as yet untouched. Even the lands that are worked are not made to produce to their fullest capacity. For example, the Korean rice crop is only 25 bushels[6] to the acre, whereas Japan raises 34[7] and the United States 35[8]. The reason for this is not due to the indolence[9] of the Korean peasant but to the practices of the former Korean government. Under the old system a man had no incentive to grow more than he actually needed for his own family, for any surplus crop would not enrich him but would be stolen by corrupt officials under the guise of taxes. So agricultural methods were not improved, nor the lands brought to their fullest use. The Japanese government has sought to change the attitude of the farmer toward his land by lessening the severity of the government upon the farmer. The state now seeks to better farming by establishing experiment stations, model farms and by distributing seeds and agricultural implements, and by encouraging the use of waste lands. In the short time this changed policy has been in vogue crops have been made greater in volume and the cultivated area increased by a million acres.

Rice. The relation that agriculture bears to all other industries is reflected in the preponderance of rice over other crops. The rice-growing zone of the world lies between the Tropic of Cancer and 40° N. All but the extreme northeastern tip of Korea lies within this area. Rice is a crop that requires a heavy summer rain. The warm southwest winds that rise in the Indian Ocean in the summer and sweep across the Pacific and the Yellow Sea bring to Korea, which stands directly across their path, a copious supply of moisture. All of Korea falls under the influence of these rain-bearing winds, but the southwest gets the greatest benefit from them. In the winter, the winds blow from the northeast, from the interior of Siberia, and have little moisture in them. Korea gets her rain when she needs it most, in the summer. The

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5 British Consular Report.
Japanese Report on Reforms and Progress in Korea 1911-12.

6 Report on Progress in Chosen.

7 Japan Year Book 1910.

8 U. S. Census 1910, Vol. V, on Agriculture, p. 621.

9 Korean peasants who emigrated to Manchuria became successful farmers.

average rainfall of Korea is 36 inches, of which 21 falls in the warm months of June, July and August. Rice is planted in nurseries in May, transplanted to paddy fields in June, and harvested in October, so the distribution of rain, as far as rice is concerned, could not be bettered. The best rice grows on low, muddy plains. Very fortunately the little lowland that Korea possesses is, for the most part, in the southwest, just where the greatest rainfall comes. Although the general average rainfall is 36 inches the southwest is blessed with 42 inches, so the two factors necessary for the best rice production, heavy summer rain and low land, are found in southwest Korea.

There are two distinct varieties of rice, that grown on lowlands under water and known as "paddy," and that grown on higher, drier land and known as "upland." Paddy crops yield more per

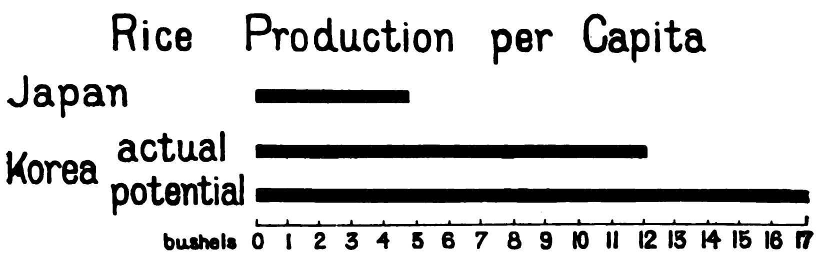

FIG. 2 (see also rice area, Fig. 1.)

acre than upland rice, and the harvest is sure. Upland rice is poorer in yield and the result of a season's labor is very uncertain. The greatest area of Korean paddy fields is on the southwest lowland, with additional small acreage along the narrow ribbon of lowlands on the east coast and northwest border. Notwithstanding the definite greater yield of paddy, so much of Korea is hilly that the number of acres in upland rice is almost double that in paddy fields, so upland rice is the characteristic crop of Korea. The country is so well fitted for rice production that it is grown over the whole arable area, and, in fact, 6,345,181 acres of the total 6,750,000 acres are devoted to this one crop. Because of the large yield on the one hand, and the unremitting labor required, which makes cheap labor necessary, rice is particularly fitted to a dense population.

Japan, long accustomed to a rice diet, cannot supply enough for her own needs. Korea has more than sufficient to feed her own population, and so, under Japanese control, will not decrease the acreage under rice, but rather will increase it, and endeavor

to make the yield per acre larger. They hope also to stimulate rice growing by removing the export duty on it. So far Korean rice has been inferior to Japanese because of the crude methods of culture, but more largely on account of the careless way in which it was cleaned and shipped. It was mixed with sand, stones, seeds and weeds. The Japanese have given instruction in the proper preparation of the rice and have distributed improved rice combs among the Korean farmers. Rice is Korea's greatest export, and all of it goes to Japan. What the Mississippi Valley is to the United States, Korea is to Japan. In Japan much of the former land devoted to rice has become too valuable for that purpose. It is now being used for factory and town sites, so Japan is forced to turn to Korea or some other nation for her rice. Japanese rice is of such good quality, and therefore so high priced, that only the richer people can afford to eat it. The farmer sells his own rice crop in the town and then buys Korean or Indian rice for his family's food. At least a third of the rice eaten by the poor people in Japan comes from Korea. Japan's need and Korea's supply of this one staple are enough to explain Japan's active interest in Korean affairs.

In Korea, the rice kernel is eaten by the people and distilled into rice beer. The outer husk is ground to a bran and makes excellent cattle food. The straw is used for fodder, for weaving mats, hats and baskets, for making paper, and for thatching roofs. So rice is far more than a mere staff of life in Korea. It is the one thing that makes life possible.

For the most part rice is grown on small holdings. The average size of a paddy field owned by one farmer is one acre. The upland rice fields are slightly larger, the average size being one and three-fourths acres per family. This state of affairs is not likely to continue, especially in the southwest and southeast. Rice land sells for $15[10] an acre in Korea. Land of the same character is valued at $150 per acre in Japan. Hence Japanese capitalists have sought to acquire large holdings of Korean lands, because the reforms instituted in Korea since its annexation are sure to enhance the value of rice property there and bring it near to a parity with Japanese land values. The simple-minded Korean peasant, dazzled by the sight of ready money, is easily induced to part with his holdings. Therefore the future may see the great rice areas of Korea worked under the tenant system. Already the Japanese holdings in southern Korea are 180 acres per Japanese farmer,

10 British Consular Reports.

which is 50 times the average holding in Japan. There are 37,500 acres owned by Japanese in southern Korea alone, and six times that amount in the whole peninsula. Herein lies part of the explantation of the hatred of Japanese by Koreans.[11]

Wheat. Although rice occupies the foremost place in Korean agriculture, it must not be understood that Korea has no other cereal crop. Nearly all the temperate zone grains are grown, but their production is distinctly secondary and supplementary to rice. Next to rice, wheat is the most important farm product. In direct contrast to rice, wheat is a dry climate plant. Yet wheat is grown in exactly the same places in Korea where rice is found. This seeming paradox is explained by the fact that Korean rainfall is a summer phenomenon. Therefore Korean winters are dry. It is in this season that wheat is planted on the southern rice areas. It is harvested just before or just after the rainy season commences. In seasons of great drought or delayed monsoons wheat takes the place of rice.

As one progresses northward in Korea the amount of rainfall gradually decreases and the climate becomes cooler. Following along the line of decreased rainfall one finds an increase in the wheat acreage, so that wheat is more typical of northern Korea than of southern. The extreme northwest of Korea has the least rainfall because it is furthest removed from the influence of the moist southwest winds and because it is surrounded by land masses and not water. Hence it is in this region that we find wheat most predominantly. The wheat crop per year in bushels is just about half as great as the rice, but since rice has a higher farm value per bushel[12] than wheat even this difference in bushels does not represent the real distinction between the two.

Other Cereals. What is true of wheat is also true of millet, barley and maize. They are planted and harvested before the rice crop is ready and before the rainy season sets in, or else are emergency crops in periods of prolonged dryness. Millet is only one-third as important a crop as rice, and barley and maize rank much lower than millet. Soya beans supplying in the Korean diet the nitrogen that rice lacks, have always been important as a supplementary supply crop, and are just beginning to appear as an export, especially into Asiatic Russia and Japan. Besides supply-

11 It is only fair to say that much of the land was formerly worked under the tenant system, members of the Korean nobility being the landlords.

12 In the U. S. wheat yields 15 bushels per acre at 96 cents per bushel, or value per acre, $14.40. In the U. S. rice yields 35 bushels per acre at 73 cents per bushel, or value per acre, $25 55. (Census 1910, Vol. V.)

ing the people with food, the bean yields an oil, its outer husk becomes a fertilizer and cattle are fed on the kernel. Tobacco is another crop found on every farmer's land and used by his own family. The tobacco is of good quality, but often spoiled in curing, so that it has a vile smell when smoked. All the people of both sexes smoke. The favorite pipe is a long-stemmed affair with a brass bowl, and is often highly ornamented.

Among the agricultural enterprises that Japan is encouraging in Korea one of the most significant is the attempt to raise cotton. Korea has never been without cotton as a crop, in the same regions where paddy fields prevail,[13] but the cotton has been poor in quality and low in quantity. To raise both the quality and quantity Japan sent men to the United States to study our upland variety. These men have attempted to introduce American methods and American

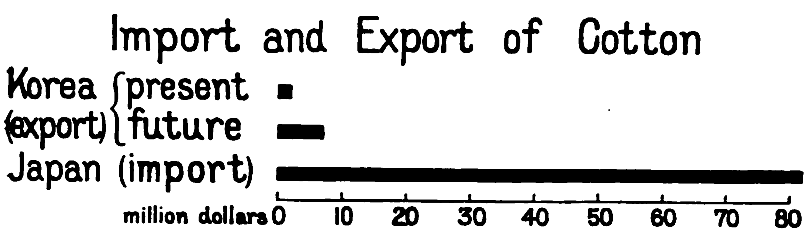

FIG. 3.

cotton seed into Korea, but have met with no great degree of success. The experts themselves did not have time to learn very much about our system and our plant. When they attempted to introduce the plant in Korea they were dealing with a people not born and bred to cotton raising and picking as are our negroes, and furthermore the Japanese overseers and Korean laborers did not speak the same language. The combination of new type of plant, new methods of work and directions given in a new tongue have militated against the experiment. All of these will disappear in time, and since Japan has a strong interest in having Korea's cotton, to help supply her spinning and weaving factories, we may rely on cotton being more extensively grown in Korea in the future. The area under trial cultivation increased from 108 acres to 6,439 acres[14] between 1906 and 1911. In all Korea 70,000[15] bales are produced per year from about 300,000 acres, an area which might

13 Cotton requires the same climate that paddy rice demands.
14 Japanese Report on Reforms and Progress in Korea, 1911-12.
15 U. S. Dept. Agriculture.

be almost doubled.[16] If we accept the Japanese estimate that 500,000[17] acres in Korea may be put into cotton, and that the yield should be 266,000 bales, we can readily find out just how valuable a source of cotton supply Korea may become to Japan. It is estimated that the Korean uses 2⅔ lbs.[17] of cotton per year. If we subtract the 69,160 bales needed by Korea's 13,000,000 inhabitants, we have left 196,840 bales for Japan's use. At $37.50 a bale this cotton would be worth $7,381,500. Japan now imports cotton valued at $86,737,300, so the maximum amount that Korea could produce would not greatly affect Japan's cotton factories.

A second industry allied to agriculture that is being introduced is sericulture. But before this can become a success the Koreans must be sufficiently trained in the habit of work to look for a by-time job such as silk culture affords, and also the Korean squalid, dirty hut in which the silk worms are grown must be made higher, cleaner, and far more light and airy, for silk worms above all else require sunlight and ventilation. In northern Korea the cultivation of wild silk is a possibility.

Ginseng. Ginseng, a peculiar man-shaped root, whose only real value is the faith the Chinese place in it, has long been an important source of income to Korea, where it grows most abundantly. It was in ginseng shipped to China that Korea paid her tribute to that country for so many decades. There are two varieties of ginseng, the wild and the cultivated. The wild grows in the northern mountains and is so valuable that the finding of one root in three years gives enough return to supply the livelihood for that period to the family of the finder. Roots of this character sell for $150 a pound. Cultivated ginseng requires constant care for seven years before it is ready to be prepared for market. Its natural color is white, but the Koreans treat it by a steaming process so that it is of a pinkish hue when seen in the Chinese market. The cultivated variety is valued at about $2 a pound, but roots that most closely resemble the human figure have a much enhanced price. The importance of the crop is not measured by the amount of land devoted to it, but by the money derived from it, and further, the fact that it formed an export material in a country that is poverty-stricken in that respect. Although barely 275 acres are planted in ginseng, yet the annual value of the crop is $130,000.[18] The Chinese use ginseng for a universal panacea, and also to quicken

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16 Maximum acreage 500,000 acres. (Japan Year Book 1910.)

17 Japan Year Book 1910.

18 This is the present acreage and value. Both were formerly much greater. Disturbed conditions in the country explain the falling off in export.

the amorous desires of a man, but it has no real qualities that fit it for either purpose. The ginseng market and the center of its culture are at a town northwest of the capital city.[19] Until the opening of the Japanese-Chinese war ginseng was a government monopoly. Between 1894 and 1908 the monopoly was farmed out to private individuals with the result that the crop suffered seriously from diseases that attacked the roots. The Japanese have again brought it under state control.

Fruit. With the farm land so cut up by hills, and with a good rainfall, one would expect to find fruit growing important in Korea, but this is not the case. The dearth of timber and the need for fuel explain why fruit trees are not often seen, although the country seems well fitted to supply most of the temperate zone fruits. In the south, a fruit tree would be cut for firewood long before it reached the bearing stage. In the north, greater severity of climate, distance from market and lack of labor, prevent orcharding. With Japanese control in Korea, fruit trees might be better protected, but it is not very probable that orchards will soon become a familiar sight, because, in Japan itself, the raising of fruit is a new industry, and the taste and desire for fruit have not yet become general.

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19 The province in which the capital is located and the one just northwest are the chief ginseng regions.

(*To be concluded*)

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Exhibition of Maps to Illustrate the Scene of Military Operations. A number of maps illustrating the seat of military operations carried on at present throughout the world are on exhibition in the Society's building. Philip's Army and Navy League map of the world is used to show the site of campaigns undertaken on the different continents. The scene of the European campaigns is shown on Stanford's Map of Europe as well as on several detail sheets which comprise: (1) portions of the 1:100,000 topographic map of Belgium by the Institut Cartographique Militaire; (2) sections of the 1:200,000 map of France published by the Ministère des Travaux Publics in Paris; (3) Vogel's 1:500,000 Karte des Deutschen Reiches; (4) sheets of the 1:300,000 map of Central Europe published by the k. u. k. Militärgeographisches Westliches Russland.

The field operations of the western European campaign are resumed on Colonel Frater's 1:864,000 "Carte de la Frontière Nord-Est de la France," while the Russian invasion of Germany and Austrian is shown on Fleming's Westliche Russland.

Plans of fortified cities and their environs are also exhibited to illustrate sieges and investments. The region around Paris is shown on 9 sheets of the 1:50,000 topographic map of France issued by the Service Géographique Militaire. Barrère's "Environs de Paris dans un rayon de 30 kilomètres" is also used.

In addition to the above, certain maps showing features of strategic value have been added to the exhibits. They include aviation maps consisting of sheets of the "Carte de l'Aéro-Club de France" on a scale of 1:200,000 on which only the detail visible at height is represented; Philip's Wireless Map of the World showing the location of wireless stations and Bartholomew's British Naval Chart showing coaling stations.

The theater of naval operations directed against coast cities is illustrated by charts compiled in European hydrographic offices.

The scene of the action of the Franco-English fleet at Cattaro is exhibited on an Austrian chart on a scale of 1:80,000. The remarkable double-bay feature of this harbor is excellently represented on this chart.

It is proposed to exhibit maps of other localities should the war unfortunately progress into new districts. The collection is a comprehensive map view of the war. It is open to the public and is being attended by over 5,000 visitors monthly.

NORTH AMERICA

Meeting of the International Congress of Americanists Postponed. Mr. W. H. Holmes, Chairman of the organizing committee of the XIXth International Congress of Americanists, announces that the members of the Congress have voted almost unanimously in favor of the postponement of the Washington session. Most of them think it would be unfair to the European members and delegates to hold the meeting at a time when they cannot attend. The committee therefore decided that, in view of the present condition of European affairs, the Congress should be postponed to a date to be determined later. The programme will remain unchanged save in so far as the organizing committee may be able to enrich and perfect it. It is hoped to hold the session next year.

The American Association to Meet in San Francisco. The American Association for the Advancement of Science will hold its general meeting in San Francisco and the neighboring university towns in 1915. The sessions will begin on Monday, August 2, and terminate on Saturday August 7. The general sessions and the general evening lectures will be in San Francisco,

and sessions for the presentation of addresses and papers in the separate divisions of science will be held chiefly at the University of California, Berkeley, and on one day at Stanford University. The Pacific Coast Committee will later supply information as to transportation, living accommodations, excursions, etc. The Pacific Coast Programme Committee suggests that the topics should relate, as far as possible, to problems of world interest which pertain especially to the Pacific area. There will be four general sessions for the delivery of addresses by eminent men on subjects of wide interest. Certain half or whole days of the week will be left free from scientific programmes in order that members may visit the exposition and other points of special interest. The scientific societies of the country are invited to hold their 1915 general meetings in San Francisco, at the same time, in affiliation with the American Association, and to appoint representatives to cooperate upon general features of the programmes, in arranging joint programmes, etc. Professor Ulysses S. Grant, of the Northwestern University, Evanston, Ill., is President of Section E (Geology and Geography) of the Association, and Professor George F. Kay, of the State University of Iowa, is Secretary.

ASIA

Sir Aurel Stein's New Expedition. The *Geographical Journal* (July, 1914, p. 40) gives some information about the work of Sir Aurel Stein since October, 1913. He started in that month from Kashgar for the Lop-nor region via Khotan. In the neighborhood of Maralbashi, at the foot of the most southern range of the Tian Shan, he surveyed a number of ruined sites going back to pre-Mohemmedan times. This region was wholly devoid of water, and, in attempting to cross the desert to the lower Khotan River, traveling was so difficult that it became necessary to turn northwards in order to save the camels. A small area of eroded ground was discovered bearing abundant remains of the Stone Age thirty miles from the Tarim River. The Tarim was then crossed and the party hurried on to Niya where the sand-buried settlement in the desert, abandoned in the third century, A. D., was revisited and some new discoveries made, especially writings on wood in the Indian language and script.

An Indian surveyor, who had been sent on ahead, carried on triangulation along the main Kuen Lun range for over 5° of longitude when heavy snowfall stopped his work. The result is that a net, connecting with the Indian trigonometrical survey, has now been carried beyond the actual Lop-nor.

Sir Aurel Stein, at the end of January, moved out into the desert north of the lagoons that terminate the Tarim River, where he found two ruined forts and a large settlement, all of the period closing about the beginning of the fourth century A. D. Many ruins were examined and fresh discoveries made showing especially the importance of the Chinese silk trade in the early part of our era. From this region the explorer went eastward on the famous ancient trade route through the desert, a journey leading to many interesting discoveries. The different parties united at Kum-kuduk and, at the date of writing, the explorer was preparing to move into Kansu for his spring work.

Protecting Chinese Monuments. Fifty-two American institutions of art and learning, in cooperation with the Asiatic Institute, New York, and the China Monuments Society, Peking, addressed a memorial, in June last, to the President of China urging means for the protection of Chinese monuments and antiquities from vandals. Essentially the same body memorialized Secretary of State Bryan, urging the employment of United States officials in the suppression of vandalism in China and the protection of American citizens and institutions from association with the criminal traffic in broken and plundered Chinese antiquities. Secretary Bryan replied that he was in hearty sympathy with the movement and that the Department of State had sent the memorial to the American Minister at Peking for distribution to the Consuls of the United States to China with instructions to use all proper endeavors to further the suppression of vandalism in China on the part of American citizens.

Exploration of the Upper Brahmaputra. In a paper read before the Royal Geographical Society on June 22, Captain F. M. Bailey described his exploration of the Sangpo, or Upper Brahmaputra River. The main results of the expedition were as follows:—The mapping of some 380 miles of the Sangpo, which had previously been done by untrained or untrustworthy explorers; the mapping of the lower course of the Nagong Chu; the discovery of Gyala Peri, a snow-peak 24,460 feet in height and its glaciers. By observing the river where it breaks through the Himalayas some information regarding its enormous drop has been gained, and the falls reported to be 150 feet in height have been proved to be merely an exaggerated rapid of thirty feet. The upper waters of the Subansivi have been discovered, and it is proved that this river rises north of the Himalayas, and breaks through the range. Many new snow-peaks, ranges, and rivers have been discovered, and a small collection of mammals, birds, and butterflies, among each of which were new species, was made.

EUROPE

A Lecture Hall for the Royal Geographical Society. The President of the Society, the Right Hon. Earl Curzon of Kedleston, at the anniversary meeting on May 18, said that arrangements had been practically concluded for the erection of a lecture hall on the grounds of the Society to seat 1,200 persons with additional rooms that will be available for smaller audiences or for exhibitions on an extended scale.

POLAR

Antarctic

The Shackleton Expedition off for the Antarctic. The *Endurance*, one of Sir Ernest Shackleton's two vessels in his new Antarctic enterprise, sailed from Plymouth, England, on August 8, for Buenos Aires with a crew of seventeen and six members of the expedition. Shackleton and the remaining members of his Weddell Sea party left England on September 18 for Buenos Aires, where they will meet the *Endurance* and sail for their destination. They propose to establish a winter camp on the coast of Prince Luitpold Land, the part of the Antarctic Continent discovered by Filchner in 1912. The *Endurance* will leave Buenos Aires about October 15, proceed to the Falkland Islands and thence to South Georgia, where she will finally coal before entering the Weddell Sea. She will leave South Georgia about the second or third week in November and a landing, it is hoped, will be effected early in December.

The personnel of the shore party (*Geogr. Journ.*, August, 1914, pp. 216-217) consists of: Sir Ernest Shackleton, leader; Frank Wild, second in command, in charge of provisions; George Marston, in charge of clothing and general equipment; Tom Crean, in charge of sledges; Captain O. Leese, in charge of motors; Lieut. F. Dobbs, and Lieut. C. Brocklehurst, each in charge of a section of dogs; J. McIlroy, surgeon and zoologist; R. W. James, of Cambridge, chief physicist and magnetician; L. Hussey, assistant physicist and magnetician; J. M. Wordie and V. Studd, geologists; F. Hurley, photographer and cinematographer; and a cook and dog-driver. Of this party of 15, Shackleton, Wild, Marston, Crean and Hurley have had previous Antarctic experience.

Shackleton plans to cross the South Polar continent from Weddell Sea to Ross Sea. He will strike out for the South Pole and from there to Beardmore Glacier, Ross Sea. This glacier was a part of the route both of Shackleton and Scott on their South Pole journeys from and to McMurdo Sound.

The destination of the second part of the expedition is Ross Sea. The ship *Aurora* will leave an Australian port about Dec. 1 and will land at McMurdo Sound (where both Scott and Shackleton had their headquarters in their Antarctic work) the following party: Lieut. Æneas Mackintosh, leader; H. Wild, in charge of stores; E. Joyce, in charge of dogs and sledges; A. Ninnis, in charge of motors; and a geologist.

This party will proceed at once to the south, lay a depot at the foot of

Beardmore Glacier and remain on the lookout for the transcontinental party. If they do not cross over the first season the depot party will return to McMurdo Sound and winter there, leaving the Antarctic the next season. Mackintosh and Joyce have had previous experience in the Antarctic.

The *Endurance* was recently built in Norway under the name *Polaris* with a view to cruises in the polar seas. Her length over all is 144 feet; breadth, 25 feet; mean draft when loaded, 13 feet. When steaming 7½ knots an hour the coal consumption per day is about three tons. The *Aurora* was Sir Douglas Mawson's ship in his recent expedition to the Wilkes Land coast.

ARCTIC

Stefansson's Northern Journey. In Vilhjalmur Stefansson's letter to the Society dated Point Barrow, Alaska, October 31, 1913 (*Bull.*, Vol. 46, 1914, March, pp. 184-191)), he said:

"The two chief features of my winter plans are a sledge journey north from Barter Island and the exploration of the Mackenzie delta. Both these projects may prove to be of considerable geographical interest. The ice journey over the sea north from Barter Island should be made in February and March. If we should attain a point only 100 miles from shore we might determine the edge of the continental shelf at least; while if we should find ice conditions favorable 300 miles does not seem too much to hope for . . . As far as I know no vessel has ever been over fifty miles from shore in the longitude of Barter Island. Barter Island hugs the coast in about 144° W. L."

A despatch to the *New York Times* from Toronto, September 1, signed by Burt M. McConnell, meteorologist of the Stefansson expedition, says that Stefansson started on his contemplated ice trip from Martin Point (about 143° W.), Alaska, on March 22,* with four sleds, twenty-five dogs, and six men. A supporting party, with two sleds and thirteen dogs was to accompany Stefansson ten days due north carrying provisions and dog food. The supporting party was then to return to shore taking barely enough provisions to last.

On March 25 the party was stopped by open water. Stefansson and McConnell shot seal which served for food for both men and dogs. On March 27, Stefansson sent some members of the supporting party back to Martin Point. The party then traveled due north until April 16, when it arrived at the edge of the continental shelf,† where there was plenty of open water. Here Crawford, Johansen, and McConnell were sent ashore, and Stefansson, Ole Anderson and Storkensen, with a good sled, six good dogs, two rifles and plenty of ammunition, continued north. Stefansson said that he would turn back at the end of fifteen days. On account of the lateness of the season unavoidable delays had prevented an earlier start. The party should have been under way in February.

Stefansson believed that the wind and currents might force him to strike eastward for Banks Island, where his party would live on the country till a relief vessel could be sent. Captain Lane of the *Bear* later cruised along the south and southwest shores of Banks Island within a half mile of the shore, and Captain Ottle of the *Belvedere* was also in that neighborhood whaling, but neither saw the beacons which Stefansson promised to build when he reached shore. McConnell says the inference is that Stefansson was unable to attain Banks Island. His party, McConnell adds, might survive for a year, as long as their ammunition held out. Stefansson is a man of unusual resource and, although the circumstances told by McConnell are unfortunate, there is no reason as yet to believe that the worst has befallen the explorers.

A despatch from Ottawa, on September 9, says that the schooner *Mary Sachs*, one of Stefansson's vessels, was reported to have left Herschel Island

*It thus appears that Stefansson was not able to start as early as he had planned.

†McConnell, if correctly reported, says that the continental shelf was reached in lat. 70°20′ N., long. 140°30′ W. If this is correct, the edge of the continental shelf was established not over thirty miles north of the Alaskan coast. About 100 miles further west, Leffingwell and Mikkelsen found the edge of the shelf about sixty miles north of the coast.

on Aug. 11 for Banks Island to establish depots for Stefansson's use if he succeeded in crossing the ice to Banks Island this fall.

The second part of Stefansson's programme, the mapping of the Mackenzie delta and the soundings of its channel, has been carried on by McConnell and Chipman. The geologist O'Neill has been exploring the Herschel Island River.

Ten Survivors of the Karluk Party Rescued. The U. S. Revenue cutter *Bear* arrived at Nome on Sept. 14 with ten survivors of the part of Stefansson's Arctic Expedition that was on the *Karluk* when, on Sept. 23, 1913, she was carried away in the ice off the mouth of the Colville River, Alaska. It will be remembered that she drifted west for 110 days, was crushed in the ice on Jan. 11, 1914, and Captain Bartlett with ten white men and some Eskimos reached Wrangell Island on Feb. 23 with supplies. An account of her drift and destruction, the subsequent adventures of her party, and the journey of Capt. Bartlett to Siberia and Alaska, with seaman Perry and some of the Eskimos, bringing the news to civilization, has been printed in the *Bulletin* (Vol. 46, 1914, July, pp. 520-523).

The ten persons who have been rescued are: William T. McKinlay, physicist in charge of observations on terrestrial magnetism, a graduate of the University of Glasgow; John Monroe, chief engineer; Bert Williamson, second engineer; Robert Templeman, steward; Ernest Chase, assistant steward; Frederic W. Maurer, fireman; an Eskimo, his wife and two children.

Two of the scientific men of the party and a fireman died on Wrangell Island and were buried there. They were: George Stewart Malloch, of the Canadian Geological Survey, a specialist in stratigraphy, who died of scurvy; Bjorn Mamen, assistant photographer and geologist, of Christiania, Norway, who accidentally shot and killed himself; and George Bretty, fireman, who died of scurvy.

According to a despatch in the *New York Times* (Sept. 15, 1914), two parties of four men each were not heard from after they separated voluntarily from their companions. One of these parties included first officer A. Anderson, second officer Charles Barker and two sailors named Brady and King. On the retreat from the *Karluk* they got within three miles of Herald Island and remained there with two sledges loaded with supplies, at the edge of the open water, while Mamen and two Eskimos returned to the scene of the shipwreck for more provisions. When the next party returned to Herald Island, on the way to Wrangell Island, the men were not to be found and were not later seen. The other party, consisting of Dr. A. Forbes Mackay of Edinburgh, surgeon of the Shackleton Expedition, James Murray, oceanographer, of Glasgow, who had been associated with the oceanographical researches of Sir John Murray, Henri Beuchat, a specialist in American archæology, and seaman Morris had left the *Karluk*, pulling their own sled, against the wishes of Capt. Bartlett, and were not seen again. It is believed that these eight men are lost.

The ten survivors on Wrangell Island were rescued by the gasoline schooner *King and Wing* and later were transshipped to the *Bear*, which was on her way to the island, her second attempt to reach it, as her first effort was defeated by incessant fog and ice. The *King and Wing* was a good boat, but it would have been impossible for her to force a way through the ice which in places rose high above the deck; there was much open water, however, and where the schooner could not force a way through the pack an opening in the ice was invariably found. There was open water along the coast to within two miles of the shore. A number of attempts have been made by vessels to reach Wrangell Island, but the *King and Wing* is the first to arrive very near it. Passage over the floe ice, to and from the two camps in which the survivors were lodged, was not difficult.

The *Bear* succeeded in getting within ten miles of Herald Island, but was unable to discover any evidences that the missing eight men had reached it.

Dr. Bruce's Expedition to Spitzbergen. Dr. W. S. Bruce left Edinburgh, on Thursday, July 9, on an expedition to Spitzbergen. The object of the expedition was hydrographic and geological research in Wybe Jansz Water, or Stor Fiord, where the coast is little known, and where there are

practically no soundings. Geological investigations formed an important item in the programme. Dr. Bruce was to be assisted by Mr. J. V. Burn Murdoch, who has previously twice accompanied him to Spitzbergen, by Mr. R. M. Craig, of the geological department of the University of St. Andrews, and by Mr. J. H. Koeppern, zoologist. Dr. Bruce was to be responsible for the conduct of the hydrographic work. The expedition was expected to be absent for about two months. It was supplied with instruments by the Admiralty and the Scottish Oceanographical Laboratory and was also supported by the Royal Geographical Society and the Prince of Monaco.

PERSONAL

Mr. Douglas W. Freshfield, the well-known alpinist and geographer, has been elected President of the Royal Geographical Society. Mr. Freshfield has written many books and articles chiefly concerned with mountains but also bringing geographical data into relation with history. It was due in part to him that the Royal Geographical Society's collection of photographs was made and that geographical education has taken its place among the recognized studies of the British universities. Mr. Freshfield recently visited our Society house on the occasion of a journey around the world.

The Academy of Sciences of Paris in July, awarded part of the Binoux Prize to Alfred Vialay for his book, "Contribution à l'étude des relations existant entre les circulations atmosphériques, l'électricité atmosphérique et le magnétisme terrestre." The book was noted in the *Bulletin* (June, 1914, pp. 456-457).

OBITUARY

Frederick Stanley Arnot. Mr. Arnot, the well-known missionary-traveler, died at Johannesburg in May. He had devoted his life to work for the welfare of the natives of south-central Africa. He went to Africa in 1881 and, in a few years, became known as an explorer as well as a missionary. He sought an elevated and healthful country in tropical Africa in which to establish a mission station and depended upon his own slender resources for the journey into the far interior. He won the confidence of unknown tribes by helpful ministrations to their sick; and, with the food they gave him and the game he killed, he and his few black attendants were able to penetrate many hundreds of miles into the interior, and finally he made his way to Bihe and Benguela, thus completing a diagonal journey across the whole of south-central Africa. His main purpose, however, was still unfulfilled and so he organized a new expedition by which he opened up a route that no one had traced. Traveling north of the sources of the Zambezi, he reached what is now known as the great copper region of Katanga, which he knew as Garenganze. Here he built his proposed missionary station and, after two years, returned to England to secure support for further work. He became well known to Africanists because, in his book "Garenganze or Seven Years in Central Africa," he gave to geographers a large amount of new information. In 1893 he published "Bihe and Garenganze" and, in 1902, brought out a connected account of his twenty years' work. He resembled his great example Livingstone in his gentle ways with the natives. He was always at peace with them and to this was largely due his success in mission work and in geographical reconnaissance.

Horace Carter Hovey. The Rev. Dr. Hovey has died at Newburyport, Mass., at the age of 81. He was a geologist who made a special study of cave formations and was the author of several volumes on the Mammoth Cave of Kentucky.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch)

NORTH AMERICA

Representative Cities of the United States. A Geographical and Industrial Reader. By Caroline W. Hotchkiss. viii and 212 pp. Maps, ills., index. Houghton Mifflin Co., New York, 1913. 7½ x 5½.

This attractive little volume was written for use in the grammar school, supplementing the geography. It has excellent features, yet there are defects in the method of treatment and in the sequence of the subject matter. Though intended to be a geography of certain cities, it is evident that the geography point of view is not maintained throughout the text. The cities discussed are San Francisco, Portland, Seattle, Denver, New Orleans, Duluth, Minneapolis and St. Paul, Chicago, Pittsburgh, Gary, Savannah, Boston, and New York.

Denver is described as the City in the Wilderness. It would be more appropriate to refer to this city in connection with elevation, gateways, tourists, mining or irrigation, for it is not known as a city in the wilderness. The volume is well illustrated and contains seven pages of statistical data in the appendix. G. E. CONDRA.

The Geology of Long Island, New York. By Myron L. Fuller. *U. S. Geol. Surv., Prof. Paper 82.* 249 pages, pls., maps, Washington, 1913.

The final appearance of the results of Mr. Fuller's work on Long Island in 1903-1905 will be a source of gratification to the many persons who are interested in this region. A large part of the report deals with the configuration of the island and the conditions under which it has developed, for the underground features are subordinate. It is a most interesting contribution to the physiography of the New York region and treated so thoroughly and clearly that it will be of great service. The area is one in which the formations of the Glacial Epoch and the immediately preceding and more recent times are particularly well displayed. From the many extensive and instructive exposures one can decipher the sequence of events of the Quaternary period. The conditions in earlier glacial time are especially clear, so the Long Island section is typical for a wide area. Fuller discusses the geologic history in detail and reviews its bearing on the Pleistocene of adjoining regions. Consideration is also given to the character and origin of the submarine channel of the Hudson River. In order to make the more salient features readily accessible to teachers and others there is given a long list of notable localities with brief statement of their character. The report includes a large topographic and a geologic map of the island on a scale of two miles to the inch and contour interval of twenty feet which will be very serviceable. There are also many special maps and other illustrations. N. H. DARTON.

The Story of California from the Earliest Day to the Present. By Henry K. Norton. 390 pp. Maps, ills., index. A. C. McClurg & Co., Chicago, 1913. $1.50. 7½ x 5.

Before Juan Rodriguez Cabrillo discovered California on Sept. 28, 1542, the inhabitants of the most favored portions of this land were only slightly advanced in the social scale above the brute. They had no common language, no tribes, no religion. At the present day, San Francisco is extending her eight miles of wharfage, and $25,000,000 are to be spent for this purpose in an effort to accommodate the increased traffic which is expected from Oriental commerce, and the opening of the Panama Canal.

Thus a great and striking change has taken place in this Pacific state from the time it was first seen by a white man up to the present day. It is with the social, political, and religious events that have occurred in this evolution of California that the book deals. Added to the historical value of the volume are its numerous illustrations and maps. WILBUR GREELEY BURROUGHS.

La República Mexicana. Reseñas Geográphicas y Estadistícas. Vera Cruz, 86 pp. Coahuila, 49 pp. $1.50. Nuevo Léon, 64 pp. $1.50. Chihuahua, 26 pp. $1.00. Chiapas. Por Enrique Santibáñez, 29 pp. $1.25. Sonora, 10 pp. 90 cts. Territorio de la Baja California. Por Léon Diguet. $1.50. Maps, ills., in each. C. Boret, Paris & Mexico, 1908-12. 13 x 10.

A popular description of Mexican territory by natives of the country. The work is informative in a broad sense with a tendency to emphasis on the country's natural resources and the economic conditions prevailing at the close of the Diaz régime. Condensed, yet clear descriptions of geographical and historical features as well as of the inhabitants and customs are presented along with numerous photographs and maps. It is to be hoped that the parts dealing with the remaining states will soon be issued. LEON DOMINIAN.

Life in Mexico during a Residence of Two Years in that Country. By Madame Calderon de la Barca. Everyman's Library. xxxviii and 542 pp. J. M. Dent, & Sons, London, 1913 (?). 1s. 7 x 4½.

The original edition of Mme. Calderon de la Barca's Life in Mexico appeared in 1843. The recent reprint in Everyman's Library is equally timely, for it is a book worth reading about the intimate side of conditions in a country of which we know so much and so little. The letters which make up the volume are personal narratives, written in a delightfully appealing style, full of keen observations, kindly humor and sane philosophy. Modern Mexico is so little changed, in many essentials, from the Mexico of three-quarters of a century ago, that these letters seem to be of the very present. The volume is for the odd hour, rather than for continued reading.

RICHARD ELWOOD DODGE.

Mexico, the Wonderland of the South. By W. E. Carson. xiii and 499 pp. Map, ills., index. The Macmillan Co., New York, 1914. $2.50, 8½ x 6.

A new edition containing data needed to bring the book up to date in view of the disturbances of the past three years. It is regrettable that the author did not arrange his topics in orderly sequence. He gives much accurate information that would be more useful if presented systematically. In spite of this defect the book is well worth reading. LEON DOMINIAN.

CENTRAL AMERICA AND WEST INDIES

Kostarika. Beiträge zur Orographie und Hydrographie. Von Prof. Henri F. Pittier. 48 pp. Map, profiles. *Ergänzugsheft No. 175 zu Petermanns Mitt.*, Gotha, 1912. 11 x 7½.

The map at the end of this monograph and the beautiful pen sketches that supplement it attract the attention far more than the text. The sketches give a clearer impression of the Costa Rican landscape than any quantity of photographs or than the forty-eight pages of description by the author. The ground plan of Costa Rica is here presented by a wealth of detail not formerly accessible in a single work. Each small subdivision of the country is described not only with reference to its mountain ranges, its valleys and plains, but also with reference to the individual mountains and even the hills and brooks. The result is that one may find here any topographic or hydrographic feature of Costa Rica in which he may be interested.

But, on the other hand, one finds little of philosophical interest. The trees and not the woods are kept constantly in the foreground. Such explanatory paragraphs as that on page 30, describing a recent change in the hydrography

of the Cordillera de Talamanca and the paragraphs on pages 31 and 32 dealing with the changes of level of the Atlantic coast seem rather more accidental than as parts of a definite plan. The long table of elevations, combined with the maps and detailed description, make this a valuable reference paper on the physical features of Costa Rica. ISAIAH BOWMAN.

The Panama Canal. A History and Description of the Enterprise. By J. Saxon Mills. 344 pp. Maps, ills. Sully & Kleinteich, New York, 1913. $1. 7½ x 5.

A third of the book is given to the canal project before the United States took hold of it. Excellent chapters are then given to the health problem on the isthmus and how it was solved and to the civil administration and phases of the social life after the arrival of the Americans. The problems of construction are then discussed, with chapters on the Culebra Cut and the locks. The completed canal is next described and the remainder of the book is devoted to a simply written exposition of the new ocean highways thus opened and the relations of the canal to the trade of the world. The author has succeeded in compacting a great deal of matter in small space and making all of it very readable.

The Panama Gateway. By J. B. Bishop. xiv and 459 pp. Map, ills., index. Charles Scribner's Sons, New York, 1913. $2.50. 9 x 6.

Although the output of books on Panama has been large during the past two years, few, if any, of their authors could claim to write with the fullness of knowledge which characterizes the present work from the pen of the Secretary of the Isthmian Canal Commission. Mr. Bishop first reviews the history of the events leading to the American purchase and control. He then gives an account of the construction and the conditions prevailing during the progress of the important work. His details, enlivened by bits of personal reminiscences, are illuminating. The work is probably the most instructive unofficial compilation on the canal. The author's position and his years of residence along the banks of the new waterway lend the weight of legitimate authority to everything he records. LEON DOMINIAN.

SOUTH AMERICA

South America. By W. H. Koebel. Series: The Making of the Nations. x and 292 pp. Maps, ills., index. A. & C. Black, London. The Macmillan Co., New York, 1913. $2. 8½ x 5½.

A creditable attempt to give the history of a continent within the narrow bounds of an ordinary volume. The presentation of events and conditions is brief perforce. It may not satisfy some readers. Nevertheless, the survey of South America's past is decidedly instructive. The mystery of the pre-Columbian period and the spell cast by the daring of explorers and colonizers burst through the limitations imposed by space. The author's genuine interest in South America is transcribed by a full-blooded hand. He writes broadly and impartially. The book should go far in imparting a better understanding of Latin Americans at this, the dawn of our intimacy with the many qualities characteristic of their race. LEON DOMINIAN.

The Amazing Argentine. A New Land of Enterprise. By John F. Fraser. 291 pp. Ills., index. Funk & Wagnalls Co., New York, 1914. $1.50. 8 x 5½.

A snappy, reportorial story of a tour through Argentina, which tells the tale of the now familiar South American tour, including the railroad trip in the tunnel through the Andes from Argentina to Chile. Although Argentina has far from reached its full development and is still a land of opportunity, there is a well-nigh insuperable chasm between the moneyed and the laboring classes. In spite of its stable government and sound financial system, Argentina still exacts a religious test of the occupant of the presidency. It supplies its grain and cattle to the world, it has an ever increasing railroad system, with luxurious modern accommodations, but it has no coal, and very little industrial development. There is no native art or literature. DAVID H. BUEL.

Ecuador. Its ancient and modern history, topography and natural resources, industries and social development. By C. R. Enock. 375 pp. Map, ills., index. C. Scribner's Sons, New York, 1914. 9 x 6.

The author has long been a careful student of the South American countries. The literary results of his labors have greatly improved in value since he began to write on these republics. The present volume is a well-ordered treatment of Ecuador in the varied aspects of country and peoples. It is packed with information, and the geography of the country has its full share of attention. The index, for its best usefulness, might well be more copious, and a map of larger scale would be more useful.

To the River Plate and Back. The narrative of a scientific mission to South America, with observations upon things seen and suggested. By W. J. Holland. xiii and 387 pp. Ills., index. G. P. Putnam's Sons, New York. 1913. $3.50.

A commonplace journey from New York to Buenos Aires was made a voyage of discovery through the observations and interests of a scientific observer. The object of the trip was to install in the National Museum of Argentina a replica of *Diplodocus carnegiei*. This book would be superfluous but for the keen insight of the writer, who looks upon the ocean as the "mother of life," finds spider webs in the air thirty miles from land, captures moths 400 miles out and views the heavens with a knowledge of their vastness and inspiration. A brief stop at Bahia and a longer one at Rio de Janeiro allows the naturalist to compare the life of the southern continent with the northern and, preferring the country to the town, he turns to the woodlands and also gives an unusual view of these southern ports of commerce. The days about La Plata are filled with trips to interesting points in Montevideo, La Plata, Mar del Plata and Tucumán, but it was the Museum at La Plata with its suggestions of past and present, the fossil beds of Mar del Plata and the cross-section of South American life in the side trip to Tucumán which attracted the author. Throughout the text there is a sprinkling of the present conditions, buildings, customs, industries and activities, to yield an appreciation of the present status of the country. The story has a delightful personal touch because of the wide acquaintance of Dr. Holland and, through the medium of his scientific mission, many new acquaintances, leaders in statesmanship and in science, are introduced. The author presents many photographs and eight of his own sketches in color. There are few books on the country about the river Plate which cover so much ground and yield so great a return to the reader as this one.

ROBERT M. BROWN.

The Putumayo. The Devil's Paradise. Travels in the Peruvian Amazon region and an account of the atrocities committed upon the Indians therein. By W. E. Hardenburg. Edited and with an introduction by C. R. Enock. Together with extracts from the report of Sir Roger Casement confirming the occurrences. 347 pp. Map, ills., index. T. Fisher Unwin, London, 1913 (?) 9 x 6.

This narrative is the record of the atrocities committed by the half-breed officials of the Peruvian Amazon Company upon the native rubber collectors of the Putumayo district, lying between the Cara-Parana, and Igara-Parana, tributaries of the Amazon in the Loreto district of Peru. W. E. Hardenburg, an American engineer, and his companion W. P. Perkins, penetrated the Putumayo district, barely escaped with their lives from the half-breed officials of the rubber company, and describe outrages on the natives, which rival, if they do not surpass, the atrocities of the Congo rubber district. These charges were taken up by the London *Truth* and the Anti-Slavery Society, and resulted in an investigation by the British Foreign Office which substantiated the allegations. The Peruvian Government at first denied the accusations and afterwards claimed the outrages had been stopped. But they are said to exist still.

DAVID H. BUEL.

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These notes do not preclude more extended reference later

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CANADA TO-DAY—1913. The best annual reference book on Canada, its progress, prosperity and opportunities. 252 pp. Map, ills., index. Canada Newspaper Co., London, 1913. 2s. 12½ x 9.

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THE BARBADOS HANDBOOK. By E. G. Sinckler. 3d edit. xii and 233 pp. Ills., index. Duckworth & Co., London, 1914. 2s. 6d. 9 x 6.

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AUS DEM ERBE DER INKAS: BOLIVIEN. Eine geographisch ethnographische Studie. Von M. J. von Vacano. 120 pp. Map, ills. D. Reimer (E. Vohsen), Berlin (no date). Mk. 4. 9 x 6½.

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BOYD ALEXANDER'S LAST JOURNEY. With a memoir by Herbert Alexander. vii and 296 pp. Maps, ills., index. Longmans, Green & Co., New York, 1912. $3.50. 9 x 6.

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NEW MAPS

Edited by the Assistant Editor

For system of listing maps see p. 74 of this volume

Maps issued by United States Government Bureaus

U. S. Geological Survey

Topographic Sheets

(Including Combined and Special Topographic Maps)

Arizona. Phoenix Quadrangle. Surveyed in 1903-1904 and 1912. 1:62,500. 33°30′ - 33°15′ N.; 112°15′ - 112°0′ W. Contour interval 25 ft. Edition of June 1914.

California. Petaluma Quad. Surveyed in 1910-1912. 1:62,500. 38°15′ - 38°0′ N.; 122°45′ - 122°30′ W. Interval 25 ft. Edit. of June 1914.

California-Nevada. Mt. Morrison Quad. Surveyed in 1911-1912. 1:125,000. 38°0′ - 37°30′ N.; 119°0′ - 118°30′ W. Interval 100 ft. Edit. of June 1914.

Minnesota. Deerwood Quad. Surveyed in 1912. 1:62,500. 46°30′ - 46°15′ N.; 94°0′ - 93°45′ W. Interval 10 ft. Edit. of June 1914.

Ohio. Troy Quad. Surveyed in 1911-1912. 1:62,500. 40°15′ - 40°0′ N.; 84°15′ - 84°0′ W. Interval 10 ft. Edit. of June 1914.

Oklahoma. Nowata Quad. Surveyed in 1912-1913. 1:125,000. 37°0′ - 36°30′ N.; 96°0′ - 95°30′ W. Interval 50 ft. Edit. of July 1914.

Oregon. Oregon City Quad. Surveyed in 1911-1912. 1:62,500. 45°30′ - 45°15′ N.; 122°45′ - 122°30′ W. Interval 25 ft. Edit. of June 1914.

[Includes the southern part of the city of Portland, the nucleus of which is shown on the adjoining Portland sheet (latest edition, 1905).]

Washington. Malaga Quad. Surveyed in 1911-1912. 1:62,500. 47°30′ - 47°15′ N.; 120°15′ - 120°0′ W. Interval 25 ft. Edit. of July 1914.

Maps Accompanying Publications

Illinois. (a) Map Showing Areal Geology of the Peoria Quadrangle, Illinois. 1912. Geology by State Geological Survey. 1:62,500. 40°45′ - 40°30′ N.; 89°45′ - 89°30′ W. 14 colors.

(b) Map Showing Economic Geology of the Peoria Quadrangle, Illinois. 1912. Geology by State Geological Survey. Same scale and coordinates as map (a). 10 colors.

Accompany, as Pls. I and II, in pocket, "Geology and Mineral Resources of the Peoria Quadrangle, Illinois" by J. A. Udden, *U. S. G. S. Bull. 506,* 1912.

Kentucky. (a) Topographic Map of the Southeastern Part of the Monticello Quadrangle, Kentucky, Showing Location of Oil and Gas Pools, Deep Wells, and Outcrop of and Structure Contours on the Spann Limestone Member of the Pennington Shale. 1:62,500. 36°53.3′ - 36°45.0′ N.; 84°53.3′ - 84°45.0′ W. 4 colors.

(b) Sketch Map of Wayne County, Ky., Showing Location of Oil and Gas Pools. [1:230,000]. [37°0′ - 36°35′ N.; 85°3′ - 84°30′ W.]

(c) Sketch Map of a Portion of Little South Fork Oil District, Wayne County, Kentucky. [1:24,000]. [36⅔° N. and 84¾° W.] 1 color.

Accompany, as Pls. III, IV and VI respectively, "Reconnaissance of Oil and Gas Fields in Wayne and McCreary Counties, Kentucky" by M. J. Munn, *U. S. G. S. Bull. 579,* 1914.

South and North Dakota. (a) Geologic Map of the Old Standing Rock and Cheyenne River Indian Reservations, North and South Dakota. By

W. R. Calvert, V. H. Barnett, A. L. Beekly, and Max A. Pishel. 1914. 1:500,000. 46°25′ - 44°30′ N.; 102°0′ - 100°15′ W. With inset showing location of main map.

(b) Reconnaissance Topographic Map of Parts of the Old Standing Rock and Cheyenne River Indian Reservations, North and South Dakota. Base compiled from General Land Office map. Contours . . . by A. L. Beekly and . . . Max A. Pishel. Surveyed in 1909. 1:125,000. 46°3′ - 45°8′ N.; 102° - 101° W. 2 colors.

Accompany, as Pls. I and II, respectively, "Geology of the Standing Rock and Cheyenne River Indian Reservations, North and South Dakota" by W. R. Calvert, A. L. Beekly, V. H. Barnett and H. A. Pishel, *U. S. G. S. Bull. 575,* 1914.

[Map (a) a black-and-white geological map; map (b) a topographic map with the customary contours in brown (interval 50 ft.) and drainage in blue.]

Utah-Colorado. Map of Parts of Colorado and Utah Showing Present Known Extent of Bituminous Shale. 1:750,000. 40°17′ - 39°12′ N.; 110°50′ - 107°47′ W. Accompanies, as Pl. I, "Oil Shale of Northwestern Colorado and Northeastern Utah" by E. G. Woodruff and D. T. Day, *U. S. G. S. Bull. 581-A,* 1914.

Washington. Reconnaissance Map of an Area Examined for Oil and Gas on the West Slope of the Olympic Peninsula, Washington. 1:250,000. 48°2′ - 47°8′ N.; 124°40′ - 123°43′ W. Accompanies, as Pl. II, "Oil and Gas in the Western Part of the Olympic Peninsula, Washington" by C. T. Lupton, *U. S. G. S. Bull. 581-B,* 1914.

Western States. (a) Map of the Western States, Showing Areas Covered by Topographic Surveys and the Scale Employed for Each Area. [1:14,200,000]. 51° - 29° N.; 127° - 101° W. 6 colors.

(b) Map of the Western States, Showing Areas Covered by Geologic Surveys and Kind of Work Done. Same scale and coordinates as map (a). 3 colors.

(c) [Fourteen maps, 1:2,500,000, in three to four colors, showing location of mining districts, viz:] (1) Arizona; (2) Northern Counties of California; (3) Southern Counties of California; (4) Colorado; (5) Idaho; (6) Montana; (7) Nevada; (8) New Mexico; (9) Oregon; (10) Part of South Dakota; (11) Western Texas; (12) Utah; (13) Washington; (14) Wyoming.

Accompany: map (a) as Pl. I, map (b) as Pl. II, and the maps under (c) as Pls. III-XVI, "The Mining Districts of the Western United States" by J. M. Hill, *U. S. G. S. Bull. 507,* 1912.

[Map (b) is a helpful index map showing the location and extent, within the region, of all the areas described geologically in the *Geologic Folios, Monographs* and *Professional Papers* of the Survey as well as of all existing geological surveys, whether published or unpublished. The fourteen maps listed under (c) show the location and name of each mining district and the predominant mineral being extracted there.]

Wyoming. Outline Map of the Wind River Basin, Wyoming. 1:625,000. 44°0′ - 42°20′ N.; 110° - 108° W. Accompanies, as Pl. I, "Gold Placers on the Wind and Bighorn Rivers, Wyoming" by F. C. Schrader, *U. S. G. S. Bull. 580-G,* 1914.

AFRICA

German Southwest and Portuguese West Africa. (a) Die deutsche Zone des Okawango nach den Aufnahmen Franz Seiner's im Jahre 1911. Mit Benutzung aller vorhandenen Materialien bearbeitet von H. Nobiling und W. Rux unter Leitung von Paul Sprigade. 1:100,000. 4 colors. In two sheets, viz.:

Blatt 1. [In three parts:] (1) Sektion a. 17°6′ - 17°39′ S.; 18°35′ -19°8′ E. (2) Sektion b. 17°37′ - 17°44′ S.; 19°8′ - 19°41′ E. (3) Sektion c. 17°43′ - 17°49′ S.; 19°41′ - 20°14′ E.

Blatt 2. [In three parts:] (1) Sektion d. 17°45′ - 18°2′ S.; 20°14′ - 20°47′ E (2) Sektion e. 17°52′ - 18°4′ S.; 20°47′ - 21°19′ E. (3) Sektion f. 17°56.2′ - 18°16.5′ S.; 21°19.5′ - 21°52.5′ E.

(b) Die Grauwackenzone des Okawango von Libebe bis Popa nach den Aufnahmen Franz Seiner's im Jahre 1911. Mit Benutzung aller vorhandenen Materialien bearbeitet von P. Just unter Leitung von Paul Sprigade. 1:25,000. 18°1.3′ - 18°6.3′ S.; 11°31.7′ - 11°40.6′ E. 4 colors.

(c) Karte der Aufnahmen Franz Seiner's im Kungfeld und nördl. Sandfeld im Jahre 1912. Mit Benutzung aller vorhandenen Materialien bearbeitet unter Leitung von Paul Sprigade von H. Nobiling. 1:500,000. 17°52′ - 20°0′ S.; 18°33′ - 20°35′ E. 2 colors.

Accompany: map (a), as Karten 5 and 6, map (b) as Karte 7 and map (c) as Karte 8, "Ergebnisse einer Bereisung der Omaheke in den Jahren 1910-1912" by F. Seiner, *Mitt. aus den Deutschen Schutzgeb.*, Vol. 26, 1913, No. 3, pp. 225-316.

[Map (a) a very complete map of the valley of the Kubango, or Okawango, River, from just above where it begins to form the boundary between German Southwest and Portuguese West Africa to its entrance into British territory (Bechuanaland). River bluffs in brown shading, part of the flood-plain periodically inundated in buff, permanent watercourses in blue, periodic in green; there are also very complete indications as to vegetation. A minor point: the reference, in the legends explaining the symbols used to denote the click sounds, to the palatal sound as "palatinaler Schmalzlaut" almost seems like an unconscious assimilation to "Palatinate"; in the text (p. 299) the correct form, "palatalis," is used. Map (b) covers, on four times as large a scale, the central part of the stretch of the river shown in Sektion f. Map (c) is a general map, on a large scale, however, of the Kungfeld, a sand desert on the western edge of the Kalahari province (as defined by Passarge), crossed diagonally from southwest to northeast by the periodic Omurambu-u-Omatako, which debouches into the Okawango.]

Kamerun-Nigeria. (a) Übersichtskarte der deutschen Grenze zwischen Yola und den Crossschnellen, bearbeitet von M. Moisel. 1:2,000,000. 9½° - 3° N.; 8° - 14° E. 5 colors.

(b) Karte des Triangulationsnetzes der Yola-Crossschnellen-Grenzexpedition (1907-1909) mit der Eintragung der 1912 vermarkten Grenze. 1:1,000,000. 9° - 5⅘° N.; 9° - 12½° E. 1 color.

(c) Grenzgelände zwischen Pfeiler 24 u. 35. Aufgenommen u. gezeichnet von Oberleutnant Detzner, November 1912. [1:300,000.] [8⅗° - 8° N.; 11⅛° - 11⅗° E.]

(d) Das Quellgebiet des Suntai-Flusses. Aufgenommen und gezeichnet von Oberlt. Detzner, Dezember 1912. [1:210,000]. [7¾° - 7½° N.; 10½° - 11° E.]

Accompany: map (a) as Karte 9, map (b) as Tafel 2, and map (c) and (d) on pp. 321 and 323 respectively, "Die nigerische Grenze von Kamerun zwischen Yola und dem Cross-Fluss" by H. Detzner, *Mitt. aus den Deutschen Schutzgeb.*, Vol. 26, 1913, No. 4, pp. 317-338.

[Map (a) a general map showing the Kamerun-Nigeria boundary as recently laid down by the boundary commission, of the German contingent of which the author was the chief. Map (b) shows the triangulation system and, in red, the precise course of the boundary. Maps (c) and (d) are details in black-and-white of two sections of the boundary; relief is in contours.]

ASIA

China. Cartes itinéraires d'I tch'ang à Yun nan fou et Li Kiang par le Yang tseu Kiang et la vallée du Kien tch'ang; Voyage du Comte Ch. de Polignac, levés du Capitaine de frégate Audemard. 1910. [One general map, one index map, and 15 sheets of route surveys, accompanied by an "Index Géographique," in cloth pocket, as follows:]

(a) De Changhai à I tch'ang par le Yang tseu Kiang. Carte dressée par le Capitaine de frégate Audemard d'après les documents les plus récents. 1912. 1:1,250,000. 32⅗° - 28½ N.; 111½° - 122° E. Oriented N. 12° E. 3 colors.

(b) Carte-index des itinéraires. 1:3,000,000. [32½° - 24° N.; 98° - 111½° E.]. Oriented N. 19° E. 3 colors.

(c) [15 sheets of route surveys, in 2 colors, unless otherwise noted, viz.:] (1) Yang-tseu Kiang d'I-tch'ang à Tch'ong k'ing. 1:560,000. 31°15' - 29°30' N.; 106°20' - 111°20' E. Oriented N. 15° E. 1 color. With inset: Croquis du Yang-tseu kiang de Tch'ong k'ing à Soui fou. 1:850,000. 29°40' - 28°40' N.; 104½° - 106½° E. Oriented N. 15° E. 1 color. (2) De Tch'ong k'ing à Tseu lieou tsing. 1:250,000. 29°43' - 29°11' N.; 104°29' - 106°44' E. Oriented N. 2° W. (3) Tseu lieou tsing à Tch'eng) tou. 1:250,000. 30°45'-28°58' N.; 103°50' - 105°6' E. Oriented N. 59° W. (4) Kia ting-Tch'eng tou-Kouan hien (Rivière Min). 1:200,000. 31°10' - 29°32' N.; 103°20' - 103°35' E. Oriented N. 90° W. (5) De Kia-ting au Mont Omi. 1:60,000. 29°38' - 29°30' N.; 103°15' - 103°43' E. Oriented N. 10° E. (6) De Omi-hien à Ya-tcheou. 1:75,000. 30°0' - 29°37' N.; 102°59' - 103°32' E. Oriented N. 19° W. (7) De Ya tcheou à Ts'ing k'i hien. 1:60,000. 30°0' - 29°33' N.; 102°34' - 103°2' E. Oriented N. 48° E. (8) De Ts'ing k'i hien à Ning yue. 1:60,000. 29°34' - 29°1' N.; 102°30' - 102°40' E. Oriented N. 80° E. (9) De Ning yue à Yue shi t'ing. 1:60,000. 29°3' - 28°35' N.; 102°28' - 102°35' E. Oriented N. 90° E. (10) De Yue shi t'ing à Lou Kou (vallée du Kien tch'ang). 1:60,000. 28°37' - 28°15' N.; 102°8' - 102°31' E. Oriented N. 53° E. (11) De Lou kou à Ning yuan fou (vallée du Kien tch'ang). 1:60,000. 28°19' - 27°52' N.; 102°4' - 102°13' E. Oriented N. 96° E. (12) De Ning yuan fou au Ya long (vallée du Kien tch'ang). 1:60,000. 27°54' - 27°40' N.; 101°51' - 102°17' E. Oriented N. 26° E. (13) De Ning yuan à Yun nan fou. Carte dressée d'après les documents les plus récents. Le levé du Yangtseu et du Yalong par le Capitaine de frégate Audemard. 1:450,000. 27°55' - 24°30' N.; 101°30' - 103°0' E. Oriented N. 8° E. (14) De Li kiang à Tong tch'ouan. Carte dressée d'après les documents les plus récents. Le levé du Yang tseu et du Yalong par le Capitaine de frégate Audemard. 1:450,000. 26°53' - 25°35' N.; 100°10' - 103°35' E. Oriented N. 9° W. (15) De Tong tch'ouan à Soui fou. Carte dressée d'après les documents les plus récents. Le levé du Yang tseu kiang par le Capitaine de frégate Audemard. 1:450,000. 29°3' - 26°15' N.; 102°20' - 104°50' E. Oriented N. 29° W.

[Important maps embodying the results of a journey which led up the Yang-tze-kiang valley to Szechwan and Yunnan. The exploratory portion of the journey began at Ichang on the Yang-tze-kiang in 111½° E. (the route from Shanghai to this point is shown on map (a)). From here the route lay by boat up the Yang-tze-kiang to Chung-king (106⅗° E.), thence overland across the Red Basin of Szechwan, first west and then north to Cheng-tu, the capital of the province. From Cheng-tu the upper Min River was followed south to Kia-ting. Thence the route led first northwest, up the Yaho, to Yachow and then south-southwest along the inner side of the Ta liang shan, the easternmost of the constricted meridional ranges which form the transition between the ranges enclosing the Tibetan plateau and the mountains of Farther India. Crossing the next meridional range to the west from Ning-yüan the route led south down the Ya lung to its confluence with the Yang-tze-kiang in about 102°. From here the Yang-tze-kiang was ascended to abreast of Likiang (27° N.) and then descended again for its whole length to Ichang, with an overland trip from its southernmost bend at Lungkai (26° N.) to Yün-nan-fu and back. The route from Cheng-tu to the Yalung is shown in great detail (sheets 4-12; scale 1:60,000), while the remainder of the territory traversed is shown on relatively large-scale maps, which also embody all other work done in the region. On the detailed maps relief is shown in generalized contours in black; the large-scale maps lack relief, showing only the hydrography (in blue), the roads (in red) and the towns (in black). The range of expression is, on the whole, somewhat less inclusive than on Dr. Tafel's comparable route surveys in the Hoang-ho region (cf. under "China," *Bull.*, Vol. 45, 1913, pp. 877-879), which is not astonishing in view of the fact that these were made by a geologically trained geographer and the present surveys by a naval officer. Aside from the value, as such, of careful route surveys in China, the importance of the present maps lies in the more correct representation they afford of the upper Yang-tze-kiang than heretofore available. A detailed comparison of

the river's course above Suifu as represented in such standard sources as the *Atlas Universel de Géographie* and the China Inland Mission's *Atlas of the Chinese Empire* will bear this out. A preliminary map of this part of the journey was published in *La Géographie* in 1911 (ct. under "China" (first entry), *Bull.*, Vol. 44, 1912, p. 79). An expansion to the north of Audemard's survey of the Yalong was carried out by the Mission Legendre (cf. under "China," *Bull.*, Vol. 45, 1913, p. 319.]

Other Maps Received

NORTH AMERICA

Canada

Alberta. Harrison & Ponton's map of the city of Calgary, Province of Alberta. 1 in. to 1,200 ft. [1:14,400]. [Blue print]. Harrison, Ponton & Parker, Calgary, 1912. [Gift from the City Engineer, Calgary, Alta.]

Driscoll & Knight's map of the City of Edmonton, Province of Alberta. 1 in. to 1,200 ft. [1:14,400]. Driscoll & Knight, Edmonton, 1912. [Gift from the City Engineer, Edmonton, Alta.]

British Columbia. Plan of the City of Victoria, showing sewerage system. 1 in. to 800 ft. [1:9,600]. [Blue print]. Angus Smith, City Engineer [Victoria, B. C.], 1911.

Manitoba. Map of Winnipeg. 1,000 ft. to 1 in. [1:12,000]. City Engineer's Dept., Winnipeg, 1914.

Ontario. Map of the City of Hamilton [Ont.]. 1 in. to 800 ft. [1:9,600]. City Engineer's Office [Hamilton, Ont.], 1913.

Map of the City of London [Ont.], including the newly annexed districts. 1 in. to 800 ft. [1:9,600]. [Blue print]. City Engineer's Office, London, Ont., 1913.

Plan of the City of Ottawa and vicinity. Drawn by F. C. Askwith. Published by Guy R. Dale. Examined and approved by N. J. Ker, City Engineer. 1 in. to 800 ft. [1:9,600]. [Gift from the City Engineer, Ottawa.]

Plan of the City of Toronto. 1 in. to 2,000 ft. [1:24,000]. The City Engineer [Toronto], 1912.

Saskatchewan. Plan of the City of Regina, Saskatchewan. [Blue print]. [The City Engineer, Regina, Sask., 1913].

United States

Alabama. Peavy's map of Mobile, Ala., compiled from recent surveys and Mobile County records. Drawn by John R. Peavy, Jr., C. E., Asst. City Engineer. About 4 in. to 1 mi. [1:15,500]. [The City Engineer, Mobile, Ala.], 1911.

Arkansas. City of Little Rock, Ark. [Blue print]. Department of Public Works [Little Rock, Ark.], 1908.

California. Map of the City and County of San Francisco. 1 in. to 800 ft. [1:9,600]. City Engineer, San Francisco, 1910.

Map of the city and county of San Francisco. Scale about 1 in. to 1,600 ft. [1:19,200]. City Engineer, San Francisco, 1913.

Colorado. Map of the City of Colorado Springs [Col.], compiled in the City Engineer's Office. 1 in. to 800 ft. [1:9,600]. [Blue print]. [The City Engineer's Office, Colorado Springs, Col.], 1913.

Delaware. Plan of Wilmington, Del. 600 ft. to 1 in. [1:7,200]. [City Engineer, Wilmington, Del., 1913.]

Florida. City of Tampa, including city of West Tampa and adjoining territory. 1 in. to 800 ft. [1:9,600]. Sullivan & Isbell, Tampa, 1913. [Gift from the City Engineer, Tampa, Fla.]

Georgia. Map of the city of Savannah and vicinity. 300 ft. to 1 in. [1:3,600]. John W. Howard, City Engineer, Savannah, 1910.

Illinois. Map of the City of Peoria and vicinity. [Blue print]. 1 in. to 1,200 ft. [1:14,400]. [City Engineer, Peoria, Ill., 1913.]

Map of the City of Springfield, Illinois. Published by Hendrickson & Richardson [Springfield, Ill.], 1911. [Gift from the City Engineer, Springfield, Ill.]

Iowa. Council Bluffs, Iowa. 1 in. to 1,320 ft. [1:15,840]. [Blue print]. [The City Engineer, Council Bluffs], 1912.

Map of Cedar Rapids, Iowa, showing streets, parks, public buildings, etc. 6½ in. to 1 mi. [1:9,750]. Compiled and drawn by Iowa Publishing Co., Davenport, Ia., 1909. [Gift from the City Engineer, Cedar Rapids, Ia.]

Map of the City of Waterloo, Iowa, showing streets, parks, public buildings, etc. Compiled and drawn by the Iowa Publishing Co., Davenport, Ia., 1906.

Kentucky. Map of Newport, Kentucky. 1 in. to 300 ft. [1:3,600]. [Blue print]. J. B. Morlidge, City Engineer [Newport], 1913.

Massachusetts. Map of the city of Brockton, Mass. 1,000 ft. to 1 in. [1:12,000]. City Engineer's Office, Brockton, Mass., 1911.

Map of the town of Brookline, Mass. 1 in. to 400 ft. [1:4,800]. Alexis H. French, Town Engineer [Brookline, Mass.], 1911.

Map of the city of Cambridge. 1 in. to 800 ft. [1:9,600]. City Engineer, Cambridge, 1910.

Map of the City of Malden [Mass.]. 1 in. to 444 ft. [1:5,330]. [Blue print]. [The City Engineer, Malden, Mass., 1913.]

Map of Newton, Mass. 1 in. to 1,200 ft. [1:14,400]. Published by Walker Lith. & Pub. Co., Boston, Mass., 1914. [From Edwin H. Rogers, City Engineer, Boston, Mass.]

Map of the City of Quincy, Norfolk County, Massachusetts. 1 in. to 1,500 ft. [1:18,000]. Ernest W. Branch, C. E., Quincy, 1911.

Map of the City of Somerville [Mass.]. 1 in. to 600 ft. [1:7,200]. The City Engineer [Somerville], 1910.

The Price & Lee Company's new map of the city of Springfield, Mass. 1,200 ft. to 1 in. [1:14,400]. Price & Lee Co., Springfield, Mass., 1912. [Gift from the City Engineer.]

Map of Taunton [Mass.]. 1 in. to 2,000 ft. [1:24,000]. Published by Sampson & Murdoch Co., Boston, 1912. [Gift from the City Engineer, Taunton, Mass.]

Map of Waltham, Mass. 1 in. to 800 ft. [1:9,600]. Bertram Brewer, City Engineer [Waltham, Mass.], 1911.

Minnesota. Map of Minneapolis. 2¼ in. to 1 mi. [1:28,160]. City Engineer's Office, Minneapolis, 1910.

Map of St. Paul [Minn.]. 2¼ in. to 1 mi. [1:28,160]. Oscar Claussen, Comm. of Public Works, St. Paul, 1913.

Michigan. The City of Saginaw [Mich.]. [Gift from the City Engineer, Saginaw, Mich., 1913.]

City of Flint, Mich. 1 in. to 400 ft. [1:4,800]. [Blue print]. [The City Engineer, Flint, Mich.], 1914.

Missouri. City of St. Joseph, Missouri. [The City Engineer, St. Joseph], 1913.

Nebraska. Map of Lincoln, Lancaster Co., Nebraska. Compiled by Adna Dobson. [The City Engineer, Lincoln, Neb.], 1903.

Street map of South Omaha, Douglas County, Nebraska. 1 in. to 400 ft. [1:4,800]. G. W. Roberts and J. J. Kaspar, Consulting Engineers [South Omaha, Neb., 1913.]

New Jersey. Map of the City of East Orange in Essex County, N. J., surveyed by Wm. H. V. Reimer, C. E. [The City Engineer, East Orange, N. J.], 1911.

New York. Bureau of Engineering map of Albany, New York. 1 in. to 600 ft. [1:7,200]. City Engineer, Albany [1913].

Street map of the City of New Rochelle and the village of Larchmont, Westchester Co., N. Y. 1 in. to 1,200 ft. [1:14,400]. John Fairchild, C. E., Mount Vernon, N. Y., 1913.

Map of Niagara Falls [N. Y.]. 1 in. to 1,000 ft. [1:12,000]. [Blue print]. City Engineer [Niagara Falls, N. Y.], 1909.

Map of the City of Watertown, N. Y. Revised by E. W. Sayles, City Engineer. [Blue print]. [The City Engineer, Watertown, N. Y.], 1910.

Ohio. Map of the city of Akron [Ohio]. [1:14,400]. [The City Engineer, Akron, O.], 1911.

New mechanical index map of Canton, O., and vicinity. About 6 in. to 1 mi. [1:10,500]. Mechanical Index Map Pub. Co., Canton, O., 1913. [Gift from the City Engineer.]

[Map of] Cleveland, O. 2 in. to 1 mi. [1:31,680]. City Engineer's Office, Cleveland, 1910.]

Map of Columbus, O. 1 in. to ½ mi. [1:31,680]. [City Engineer's Office, Columbus, O., 1911]. [9 editions, showing:] (1) wards; (2) telephones; (3) railways and light; (4) street railways; (5) natural gas; (6) gas and fuel co.'s lines; (7) artificial gas; (8) waterworks; (9) sewers.

Map of Lorain, Ohio. Compiled from official records and actual surveys. 1 in. to 400 ft. [1:4,800]. C. M. Osborn, City Engineer [Lorain, O.], 1914.

Map of the City of Newark, Ohio. 1 in. to 500 ft. [1:6,000]. [Blue print]. [The City Engineer, Newark, O.], 1908.

Street and road map, city of Youngstown, Ohio. Scale about 2 in. to 1 mi. [1:32,000]. Platting Commissioner's Office, Youngstown, O., 1913.

Oklahoma. Donald's new pocket map of Muskogee, Oklahoma, revised and up-to-date. The official pocket map and street guide. The City Engineer [Muskogee], 1911.

Oregon. Hanson & Garrow's map of Portland and vicinity. 3 in. to 1 mi. [1:21,120]. Hanson & Garrow [Portland], 1912. [Gift from the City Engineer, Portland, Ore.]

Pennsylvania. Easton, Pennsylvania, showing division of wards. 1 in. to 600 ft. [1:7,200]. City Engineer, Easton, Pa., 1908.

Map of the city of Wilkes-Barre. [1:7,200]. Office of the City Engineer, Wilkes-Barre, Pa., 1912.

City of Williamsport, Pennsylvania, and suburbs. 1 in. to 1,000 ft. [1:12,000]. [Blue print]. [The City Engineer, Williamsport, Pa.], 1913.

Pennsylvania-New Jersey. Map of Philadelphia, Camden, and vicinity, compiled from city plans and personal surveys. 1:24,000. Published by Elvino V. Smith, C.E., Philadelphia, 1910.

Rhode Island. Map of Providence, R. I. 1,200 ft. to 1 in. [1:14,400]. Correct to spring of 1913. Published by Walker Lith. & Pub. Co., Boston. [Gift from the City Engineer.]

South Carolina. Map of the City of Columbia, S. C., showing street grades. 1 in. to 300 ft. [1:3,600]. [Blue print]. The City Engineer [Columbia, S. C.], 1912.

Texas. Map of city of Austin. C. E. Leonard, City Engineer [Austin, 1913].

Map of the City of El Paso, Texas, compiled by E. C. Baer. 1 in. to 1,000 ft. [1:12,000]. [Blue print]. [The City Engineer, El Paso, Tex.], 1909.

Utah. Map of Salt Lake City. 1,000 ft. to 1 in. [1:12,000]. City Engineer's Office, Salt Lake City, Utah, 1913.

Virginia. Map of the City of Lynchburg, Va. 1 in. to 400 ft. [1:4,800]. H. L. Shaner, City Engineer [Lynchburg, Va.], 1910.

Map of the City of Norfolk and vicinity, as authorized by the City Council. 1 in. to 800 ft. [1:9,600]. Office of the City Engineer, Norfolk, Va., 1909.

Map of Roanoke, Va. 6 in. to 1 mi. [1:10,560]. [Blue print]. F. L. Gibboney, City Engineer [Roanoke, Va.], 1914.

Washington. Spokane, Washington. [1:34,200]. Office of the City Engineer, Spokane, Wash., 1912.

West Virginia. City of Wheeling [W. Va.]. 1 in. to 800 ft. [1:9,600]. [Blue print]. City Engineer's Office [Wheeling, W. Va.], 1913.

Wisconsin. General map of City of Madison [Wis.]. 1 in. to 700 ft. [1:8,400]. E. E. Parker, City Engineer [Madison, 1913].

[The above city maps were kindly sent to the Society in response to a request addressed to the city engineers of all American cities with a population of 25,000 or more and Canadian cities of 100,000 or more. All cities of this size, it will be noted, are not represented, and the list makes no claim to completeness. An effort will be made, however, to procure the missing maps, as it is desired to make the collection as complete as possible.

No individual comment need be made, as the maps all belong to the same general type. From the geographer's standpoint they are disappointing. As a rule they merely show, usually by parallel, sometimes even only by single lines, the network of streets, and their names. Sometimes no distinction is even made between existing and proposed streets. The better maps may indicate urban transportation lines and some, public buildings. But the critical element which interests the geographer—the built-up area—is practically never shown. A city is, after all, mainly an aggregation of houses, and it is in their distribution that a geographer is interested. That the representation of this element in a city map is not an impossible requirement is shown by the admirable maps published by European, mainly Continental, municipal authorities or those issued by private publishers that there can be bought for a few cents at any book shop. For such investigations as Messrs. Hassert, Oberhummer, Hassinger and Blanchard have so successfully undertaken abroad, the American student of city geography is almost at a loss where to turn for material with regard to his own cities. The type of map listed above will not tell him where are the real geographical limits of the city, nor will they enable him to differentiate between business, city residence and suburban sections. The only map of this type known to the reviewer is the admirable map of New York, 1:21,600, issued by the Topographical Bureau of the Board of Public Improvements for the Paris Exposition of 1900; and even this has not been kept up-to-date. *Faute de mieux*, the topographic sheets of the U. S. Geological Survey can be of assistance, as frequently pointed out in this department; but their scale is rarely large enough for problems of city geography. Or else recourse may be had to that friend in need, Baedeker's "United States"; but there one finds that even for so excellent cartographers the problem has been too difficult. Following the standard of their European guide books, they have endeavored to indicate the built-up area, but the lack of material has forced them to guess, and, although they have done so intelligently, the result necessarily cannot be accurate. Information as to the built-up area is, of course, available: it can be found in the offices of superintendents of buildings, in insurance atlases and the like, but not in the form suited to the geographer. As in many other phases of his work, so in city geography, he is still constrained to prepare for himself the fundamental material for his inquiries.]

AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156TH STREET

THE OBJECTS OF THE SOCIETY

THE OBJECTS OF THE SOCIETY are to investigate and disseminate new geographical information by discussion, lectures and publications; to encourage geographical study, exploration and discovery; to establish in the chief maritime city of the country, for the benefit of commerce, navigation, and the great industrial and material interests of the United States, a place where the means shall be afforded of obtaining accurate information for public use concerning every part of the globe. The Society has been in existence since 1852. It has a constantly increasing geographical library of over forty thousand volumes and a large and very valuable collection of maps, charts, and atlases, including 30,000 sheet maps, relating to every part of the world. Consultants and students are welcomed and assisted. The books and maps they wish to consult are brought to the study tables assigned to them. The Society publishes a Bulletin, and co-operates and interchanges information with seven hundred domestic and foreign geographical and other scientific societies.

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AMERICAN GEOGRAPHICAL SOCIETY

VOL. XLVI 1914 No. 11

THE TREND OF MODERN GEOGRAPHY
A SYMPOSIUM

Conducted by G. B. ROORBACH
University of Pennsylvania

There prevails a general impression, even among geographers themselves, that there is little or no agreement as to what geography is or what its purposes and problems are. It has been commonly said that there are as many definitions of geography as there are geographers; that the subject is not a distinct and separate science with a single aim and purpose. In an attempt to determine whether or not the diversity of opinion is as great as is commonly supposed and to gain an idea as to just what present-day geographers regard as the real purpose of their subject, the following question was sent to a number of representative geographers both in the United States and Europe:

What, in your opinion, are the three most important problems that need solution, or the three most important lines of investigation that need to be followed, in the subject of geography?

In all, 39 replies were received to the letter. In the analysis which follows, however, only 29 answers are considered, representing the English-speaking countries. Of these replies 25 are American and 4 British.[1]

[1] Since, at the time of writing, only three replies had been received from continental Europe, it seemed best to restrict the analysis to the replies from Great Britain and the United States, representing the English-speaking countries. Seven American geographers acknowledged the letter, but did not answer the question; three giving as their reason inability to answer it; three could not give sufficient time for adequate answer; and one refused to answer because he regarded the investigation of little value. Of the 29 geographers repre-

That among these geographers, at least, there is nearly unanimous agreement as to what geography is, the replies clearly show. With but two or three exceptions, the letters substantially state, or imply by the line of investigations suggested, that geography concerns itself with the study of the relationship between earth and life, particularly human life. There is considerable difference of opinion as to just what lines of investigation should be followed, but almost general agreement that the aim of geographic work of whatever kind is to establish the facts of, and deduce the principles underlying, this relationship between the physical earth and its inhabiting organisms. The spirit of most of the letters is, perhaps, summed up in the statement by A. P. Brigham "that the real goal and heart of our science is in the field of human geography. Physical geography is a large, but not the largest, part of the subject. It only contributes to the deeper and wider aims that most justify geography in claiming the place of a science among sister bodies of truth." It is significant that only two of those replying gave a problem in pure physical geography as most important, and one of these two problems is suggested avowedly as an aid to the geographer in his work of interpreting life responses to physical features.

Some difficulty has been experienced in analyzing the answers for the reason that several replies have given large, general problems while others have given a specific, definite thing to be done. Some have merely stated the problems they regard as most fundamental; others have given reasons for the opinions expressed. In the analysis, the attempt has been made to group the replies under general headings, putting together, so far as possible, those suggestions that have a similarity of purpose, that look toward the solution of the same general problem, even though the specific problems suggested may be quite diverse. Of the problems sug-

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sented in the analysis, 17 are university or college professors of geography, 3 normal school professors, 5 editors of geographical publications, 2 explorers, 2 government scientists.

Those who answered the question were: Chas. C. Adams, University of Illinois; Cyrus C. Adams, Editor, *Bull. Amer. Geogr. Society;* W. W. Atwood, Harvard University; H. H. Barrows, University of Chicago; Isaiah Bowman, Yale University; A. P. Brigham, Colgate University; R. M. Brown, Rhode Island Normal School; H. G. Bryant, Geographical Society of Philadelphia; Col. C. F. Close, Director-General, Ordnance Survey of Great Britain: R. E. Dodge, Columbia University; Chas. R. Dryer; F. V. Emerson, Louisiana State University; N. M. Fenneman, University of Cincinnati; Henry Gannett, Geographer, U. S. Geological Survey; G. H. Grosvenor, Director, National Geographic Society; H. E. Gregory, Yale University; Geo. D. Hubbard, Oberlin College; Ellsworth Huntington, Yale University; Mark Jefferson, Ypsilanti (Mich.) State Normal School; W. L G. Joerg, Assistant Editor, *Bull. Amer. Geogr. Soc.;* J. Scott Keltie, Royal Geographical Society; L. W. Lyde, University College, London; A. G. Ogilvie, Oxford University; R. E. Peary; R. D. Salisbury, University of Chicago; J. R. Smith, University of Pennsylvania; W. S. Tower, University of Chicago; F. R. Waldo, Geographical Society of Philadelphia; R. H. Whitbeck, University of Wisconsin.

gested in the replies, the greatest number regarded as most important:

The Exact Determination of the Influence of Geographic Environment. Of the 29 replies, 22 stated this to be one of the chief problems facing the modern geographer or implied by their answers that this was the chief problem to the solution of which specific investigations should lead. "This is, and will long be, the crux of the geographer's problem," says A. P. Brigham. "We must not merely understand the more apparent responses that man makes and has made to natural conditions, to heat and cold, aridity and moisture, to land form, to the sea, to environing organisms—we must also seek ultimate influences, deep, remote, ancient, tangled as they may be, whatever apparent hopelessness the maze of obscure conditions and unsolved enigmas may oppose to our attempt." Here comes the need of special geographic training, for, continues Professor Brigham, "There is much loose writing on the influence of environment. Results are assigned to one cause where there are several or many possible causes. Factors lie buried under our ignorance at every turn. To know the origins and development of human culture, to grasp the various sciences of man as interpreted by the principles of modern biology, will lay some of the stepping-stones by which the geographer must toil up to surer standing-ground and to a more rational definition of the science than we yet have."

"It devolves upon the geographers," says Charles R. Dryer, "to show how the inorganic world and the organisms that live in it influence and react upon one another" and the investigations of the geographer should lead to this end. "The working out of life relations to earth factors," F. V. Emerson thinks is the most important problem, although "in America this seems rather overshadowed by technical work in physiography, due, doubtless, to the fact that most of the departments of geography have originated in, and are closely associated with, the departments of geology." R. H. Whitbeck says that the question of chief interest to himself is "to what degree physical environment has been a determining factor in organic evolution." As a more definite problem leading to the solution of this, he would have answered, as the second question needing solution: "What evidence is there that the distinguishing characteristics of the races of mankind are due to geographic environment?" L. W. Lyde also gives as a most important problem that of "the historic differentiation of human types." "If we knew the original causes of this differentiation,"

says Professor Lyde, "we should have the key to climatic naturalization, i. e., we should know how to develop at once the vast unoccupied races of the world in their essentially natural lines." J. R. Smith, while giving as the first great need "the study of the exact influence of environment on man," would also reverse the problem and study "man's influence upon the environment, especially in the form of the study of resource destruction." The investigation of the effects of the destruction of trees and forests in historic times he mentions as particularly needing study.

Other replies state more particularly problems of investigation of the influence of geographic environment that should receive attention. Ellsworth Huntington suggests as a most important investigation the determination of "the exact effect which different types of environment produce upon the human system and hence upon human character and activities." "It includes," he says, "such problems as those raised by Boas in his statement that the head form of immigrants changes when they come to America. It includes the problem of tropical diseases and other conditions of health and activity. It includes also the question of how far the character of such a people as the Germans depends upon their location in Europe and upon their climate, rather than upon some innate racial quality which is psychological rather than biological."

In this connection, emphasizing the need of more exact thinking, Professor Huntington believes that a second important line of investigation should be "the statistical analysis of a vast number of commonly accepted statements." As an example selected from many that might be given, he suggests an accurate analysis of the statement that "Britain owes her position in world affairs to her central location." Such an analysis raises important questions, as appears from a rough examination of the figures; for "so far as distance to America is concerned, Spain, Portugal, France and England are essentially on a par. They have a slight advantage over the Netherlands, Germany and Scandinavia, but manifestly this is of no great importance, for the Netherlands and Germany are vastly ahead of Spain and Portugal in the amount of communication with America." As for distance from other European countries, "England by no means has any great advantage." For example, the sum of the distances from each capital of seven of the leading European nations to the capitals of all the others shows that the combined distances from London to the other capitals are greater than from Vienna, Paris, Berlin and the Netherlands. And "when the distance of England by sea from the other countries of Europe

is considered, we find that England has still less advantage," for an examination of the proximate distances by water from the nearest important port of any one of the countries to the nearest important port in each of the others shows that the distance from France by water to eight other European countries is 2,300 miles; from Spain, 9,000 miles; from Russia, 9,800 miles; from Germany, 10,000 miles; from Austria, 10,700 miles; from the Netherlands, 10,700 miles; from Britain, 11,200 miles; from Scandinavia, 11,700 miles; from Italy, 13,800 miles. "In relation to other continents the same thing is true, for France is nearer than either England, Germany, or the Netherlands to Africa, Asia, and Australia, and is equally near to North and South America. Hence, if mere position were the factor of primary importance, it would seem as if France ought to hold the position which is actually held by Britain."

Wallace W. Atwood suggests an investigation of "how modern industrial development is being influenced by geographic conditions" as being the most promising in the study of geographic influences. This is, he says, "a world-wide problem which brings our attention to the present day, and it seems to me that it is quite appropriate for geographers to be giving more and more attention to the present."

Several replies give climatic investigations as the most important in answering the question of geographic control, but most of those who mention climatic influence mention it as but one means towards the solution of the general problem of physiographic influence. Mark Jefferson thinks "there is most need of investigation of the distribution of man over the earth and the explanation of the facts observed." This leads immediately, he says, "into the investigation of the facts of climate as probably most significant in the control of human occupation of the earth and least understood at present among all large factors." Henry Gannett says that the most important geographic subject is "the climatic changes now going on, or which have been going on in recent times, their effects on man, his migrations and his physical and mental characteristics."

H. E. Gregory is in agreement with Mark Jefferson in giving as the chief problem of geography "the distribution of the present population of the world, in general and in detail, and the causes of that distribution." Professor Gregory gives as a second important problem "the evaluation of the geographic factor in history as supplementary to, and corrective of, written documents." A means by which such a problem may be solved is given by Isaiah

Bowman, in his suggestion as a most important line of research the "study of new frontier societies." He says, "One of the greatest opportunities before us is the study of the twentieth-century colonists. To take but one example,—the colonists of the Argentine-Brazilian frontier. There one finds old-world groups set down in a border region where they are subjected to the influences of a new environment and contact with people of a distinct type, yet enjoying many of the advantages of settled societies. The part they play in the national life, the degree to which they become modified by new influences and how they help modify the original peoples in their adopted country are questions of vital interest in geography. For a long time historical geology made but slight advances because man observed only the results of the past, paying far too little attention to the key offered by present processes. Geographers may contribute in the same way to the next great advance in history by the thorough interpretation of new peoples in a frontier environment."

A large majority of the replies emphasize geographic influence in its human aspects. Three answers, however, point out the need of investigations in animal and plant geography. H. H. Barrows mentions as one of the four most pressing needs investigations particularly in animal geography, "a field in which very little has been done." Charles C. Adams, disavowing in his answer any attempt to state the most important problems, gives as "worthy of immediate investigation, on account of the present exceptional opportunities, the invasion of animals upon new land surfaces and a study of the controls involved in this, as in glacial cirques with the retreat of glaciers; in an invasion upon volcanic débris; with the evaporation of Salton Sea; and following earthquakes and large land slides."

Prof. Lyde emphasizes the need of solving the problems of plant geography as far as concerns "the relative value of the various controls in the production of our great staples, *e. g.* maize." "Much time and trouble and money," he says, "are wasted because we do not know precisely what are the really valuable or vital factors. *E. g.*, exactly how little direct relation is there between actual temperature and yield, and exactly how much between actual rainfall and yield? If we knew we should be able to economize effort and to increase returns to an almost unlimited extent."

Regional Studies. Eleven replies place investigations in regional geography among the most important. "What is most needed," says Isaiah Bowman, "is intensive field work in well-

selected regions. This means repeated return of the investigator to his chosen region until he has gained an intimate knowledge of its people and their environment and is in a position to become ther interpreter to the world." "Intensive studies in regional geography," says W. S. Tower, "represent a fundamental line of endeavor for the future welfare of geography as a whole. That I should place first among all the lines of investigation to be followed. The chief reason for that belief is that, by so doing, there would be made available not only much needed new material, but also at the same time there would be provided the basis for comparative studies of different regions." "Complete geographic interpretations of selected areas," says H. H. Barrows, "based both on field and laboratory work, would serve as type studies and help materially to standardize methods of investigation and of writing."

Regional study involves the division of the world into natural regions, according to several. In the words of Charles R. Dryer, "Environments must be studied scientifically, by the same methods as plant and animal communities are studied. However complex they may be, they must be analyzed and classified according to the totality of their characters. In this sense a natural environment must possess not only substantial uniformity, but also continuity in space. Here the special work of the geographer comes in and consists in the delimitation and mapping of the habitable earth into natural regions. This is necessary as a working scheme, however distant its standardization may be." This having been done, a second great problem for geographic investigation, says Professor Dryer, is to determine "the actual and possible economic functions of every region of the earth."

This same need is voiced by Alan G. Ogilvie, who says, "The main object of geography is the description of the earth. The most satisfactory method of attaining this object is the systematic description of natural regions. . . . This regional description should be causal and explanatory; and the evolutionary idea must be kept clearly in view. The geographical unit is to be regarded as a complex of which the various elements, *e. g.*, landform, vegetation, race, have reached certain points in their evolution." However, continues Mr. Ogilvie, "before a reasoned description of a region can be attempted, the land must be adequately mapped and investigations must be made in various branches of science, *e. g.*, geology, meteorology, botany. At the present time men engaged on those sciences have not been able to spend sufficient time

to satisfy the geographer upon what may be called the borderlands of their sciences. It is therefore advisable for the present that every geographer, in addition to his main descriptive work, should adopt some subject for special work or research, such as surveying and cartography, physiography, climatology, plant ecology, ethnology, or, in the case of geographers studying coastal regions, oceanography. In course of time these subjects ought to occupy a sufficient number of specialists. But even so, there will still be room for the geographer, who will continue to make use of the material provided by the specialists, and so work towards his description of the whole earth. When that is completed the changes brought about by civilization will probably furnish him with quite enough matter for his work."

J. Scott Keltie emphasizes this same need of regional study. The business of the scientific geographer "is to study the great features of the earth's surface in adequate detail and to investigate the influence of these features, including climate and hydrographical conditions, on the distribution of other factors on the earth's surface, and especially of humanity." Little has been done in this field, Dr. Keltie claims, even in those areas which have been adequately mapped and explored. "This," he concludes, "is a department of geographical work which might be carried on indefinitely and which has important practical bearings on the activities of the human race."

Speaking from the standpoint of American geography, four replies give North America or the United States as the region needing study. W. L. G. Joerg says: "In my opinion our greatest need is a systematic geography of the United States or, preferably, of North America, along modern lines, similar in scope to Mackinder's *Britain and the British Seas,* Partsch's *Mitteleuropa* and Vidal de la Blache's *La France: Tableau Géographique.* It should, of course, embrace all phases of the subject, both physical and human, and be sufficiently detailed to bring out all essentials. At present we have no such works in English. Those available are either out of date or ungeographical in point of view, or, where this is not the case, do not present all phases of the subject. For a distinctly geographical treatment of the topic we must turn to foreign sources, such as Ratzel's *Die Vereinigten Staaten von Nord Amerika* or Reclus's *Les États Unis.* However excellent such works may be, they cannot but lack the native investigator's sympathetic intimacy with the subject. The wealth of available material, too—especially in government and other official reports—

is a direct incentive to a synthetic treatment. A corollary desideratum is an atlas representing critically all phases of the geography of the United States or, again preferably, of North America, similar in scope to the official *Atlas of Canada,* Bartholomew's *Survey Atlas of Scotland,* or the Finnish Geographical Society's *Atlas de Finlande.* A need related to the first is a systematic geography of the outlying dependencies of the United States similar in scope to *Das Deutsche Kolonialreich,* edited by Hans Meyer. A. H. Brooks's *Geography and Geology of Alaska* is an admirable beginning."

R. E. Dodge and George D. Hubbard suggest a systematic study of the geography of each of the physical divisions of the United States. This should show, says Professor Dodge, "the relationship of climate, surface, drainage, economics and the present and past social conditions; that is, each unit should be studied as a unit area, regardless of state lines, in such a way that in the course of time we may have a series of monographs descriptive of the several natural regions of our own country, that will be authoritative and scientific." The geographic work for each division, says Dr. Hubbard, should "stand as high in geography as Bailey Willis's *Northern Appalachians* and other papers of that class stand in physiography."

"Not all geographers," says Professor Brigham, "appreciate the universal value of apparently commonplace facts of geography at their own doors. . . . Here the Germans have a large lesson for us, in the innumerable monographs relating to the population, industry, agriculture, commerce, history, evolution of culture and types of culture, in small areas of the Fatherland. This is not said in the spirit of criticism, for Germany is small and the workers are many. America is vast and the workers are few. Such special work in limited areas will afford also a vast body of immediately practical knowledge, and there is no reason why geography should not, like chemistry or physics, try to make itself as useful as possible to the common man and to every man."

Definition and Organization of Geographic Material. This need is placed among the most pressing problems by eight. The first and most important problem in geography, as distinguished from a line of investigation, says Dr. Tower, "is to remove completely the differences of opinion as to where the discussion of a geographic topic should begin and end. I find constantly evidences of nothing definite in the way of limitations on the sort of matter which may be labeled geographic. Until some general agreement is reached in this matter it must remain difficult, if not impossible, to attain anything ap-

proaching systematic organization of the subject." Secondly, continues Dr. Tower, "the problem of correlation and systematic presentation of the subject matter of geography requires attention. There is a tremendous mass of material already accumulated along different lines of the subject, much of which material is still entirely unorganized. For example, in economic geography, an enormous body of facts is easily available for discussion of one sort or another, but so far there has been no really satisfactory organization of those facts into a logical, scientific presentation of that phase of geography. As a result, we have many facts to talk about, but little in the way of principles which have been deduced from these facts."

Colonel C. F. Close is of essentially the same opinion. He says, "The most important problem is the definition of the subject itself. When we talk about chemistry, geology or astronomy we have a clear idea of the scope of these sciences, but when we talk of geography we find there is no general agreement as to its scope and we cannot even say if it is a science. There is the greatest divergence of opinion as to what geography is. Thus, I believe I am right in saying that Prof. W. M. Davis defines geography as 'modern geology,' Dr. Keltie says that geography is 'the study of the earth as the home of man,' Dr. Mill defines geography as the science which investigates the influence of the irregularities of the surface features on the mobile distribution, and I think I remember having heard Mr. Mackinder remark that 'Geography is not a science but an attitude.' This want of definiteness is a serious drawback and it has, indeed, militated against the acceptance of geography in certain universities as a subject fit to rank as a definite compartment of organized knowledge. It is, I am inclined to think, not yet, as a fact, an organized branch of knowledge. But in saying this I would in no way depreciate the admirable work done by the geographical societies. They have the great merit of covering a very wide field of interest and of introducing the earth-sciences to each other. These earth-sciences are geology, geophysics, geodesy, climatology, and meteorology and oceanography, and to those we must add exploration, surveying and cartography, which are not sciences but auxiliary arts. To the group of earth-sciences we may also add ethnography, sociology and political science as subjects which find a welcome in geographical circles. It is the note of a science that it not only accumulates records of fact but advances the thinking power of humanity by means of generalization. Every true science has its generalizations and its best energies are spent

in pursuit of them. Without them the masses of accumulated facts are unusable. I believe that at present geography has no generalization, it has discovered no general laws or relationship.'' Having settled what geography is, continues Colonel Close, the second need ''is a really scientific aim, keeping in mind the fact that a science worthy of the name must aim at the discovery of general laws.''

R. E. Dodge states the problem as ''the organization of the principles of human geography in such a way that these principles could be used by geographers, anthropologists and historians, as well as economists and perhaps sociologists in the border lands between geography and these other sciences''; H. H. Barrows as ''the collection, organization and interpretation of the widely scattered facts of geography.'' Mark Jefferson says, ''in general the greatest tasks of all are still the ascertainment of all possible facts of geography'' and the putting of them ''into groups and relationships admitting simple statements qualified by statement of the width of applicability to which they are entitled.'' N. M. Fenneman gives as one problem ''to collect, tabulate and plot the essential facts relating to human life . . . to enable the trained student, at least, to obtain the necessary data of his thinking with less wasteful effort than is now necessary'' and, as another, ''the study and formulation of those general principles of control (if there be such) which relate the facts of human life to the physical features of the earth.'' ''I have in mind here,'' he says, ''not so much the study of individual states and communities but the philosophic study of principles, which, of course, presupposes the study of individual cases. In other words, I feel that geography, like any other science, must culminate in a philosophical aspect and that without such philosophical side or culmination, the study will continue to be, as was said of it a few years ago, 'dead at the top'.''

Improvement of Geographical Education. This is mentioned as a most important problem in geography by eight out of the twenty-nine replies. It includes the establishment of geographical courses in universities, the improvement of text-books and apparatus, the training of teachers, the general spread of geographic knowledge among the people.

Richard E. Dodge states the problem thus: ''The better organization and promotion of geography in our colleges, universities and normal schools, not only for the benefit of the students thereof, but for the teachers of geography in secondary and elementary

schools, in order that geography may be a working field of knowledge appreciated by the on-coming generation and used by them to a fuller extent than it is now."

Professor Brigham states the problem as related to the training of geographers in the universities: "This involves," he says, "the establishment of chairs of geography in greater measure distinct from geology, and should lead to a broader and deeper discipline of special scholarship."

Isaiah Bowman says the great need is in the training of normal school teachers. "Distinct progress has been made in the establishment of geography in the universities. The subject is bound to have wider recognition if its research work is properly advanced. The better text-books of to-day have also greatly elevated elementary instruction. The weakest link in the chain is the normal school. One cannot view, except with the greatest distress, the existing state of affairs. Normal-school teachers of geography should be the product of the universities. It ought to be illegal for a teacher to conduct classes of students through the principles of the subject without having had advanced instruction in university or college courses. Here is a vital 'problem that needs solution.' How can we get the fact established that expert teachers of geography are absolutely necessary in normal and high schools? We are letting the blind lead the blind. Furthermore, a teacher should be inspiring. Recently a normal-school teacher said to me: 'I like to teach drawing, but how I hate geography.' The geography taught in the sixth grade was all that some of her students had had up to the time they entered the normal school. How they too must have hated geography! When one thinks of the possibilities of the subject, its almost universal human appeal when adequately taught, its fundamental relation to history and anthropology, and its disciplinary value, one is appalled to find it presented by wholly untrained teachers, out of sympathy with its spirit and blind to its treasures."

Henry G. Bryant says that geographical instruction in America needs to be improved "that it may eventually receive the same recognition here that it now obtains among the institutions of learning in Europe."

R. M. Brown not only further emphasizes the need of improved teachers and geographic apparatus in high and elementary schools, but says there should be a "distinct effort to bring the gist of geography to the busy man as well as the untutored." This latter need is given first place among geographic problems by Gilbert H.

Grosvenor, who also pleads for better teaching in the schools. George D. Hubbard adds to the need of expanding college geographic teaching that of "the development of distinctly geographic work and issuance of geographic publications by state surveys" and "more thorough recognition of geographic phases of the work of the various government bureaus, such as the Census, Weather Bureau, Department of Agriculture, Consular Service, etc."

"The one great problem," says Cyrus C. Adams, "relates to the co-operation of geographers and geographical societies to raise the standard of geographical education in this country." "There is no reason," continues Mr. Adams, "why we should not work out a revolution in the position of geographical education in this country, such as the United Kingdom has achieved in the past thirty years. . . . The influence of the work we should take in hand will ultimately filter through to the common schools. We shall have a demand for better appliances of all kinds and the improvement will be noteworthy in the newspaper and the encyclopedic treatment of the subject and confer other boons which our country sorely needs. Japan places in the hands of her common people better maps than we produce; we are inferior in such appliances to all the countries of Europe excepting Spain and Portugal, and Scott Keltie in his recent *History of Geography* singled out our country as notable for the inferiority of its non-official map products."

Geographic Factor in History. Six replies regard historical problems among the most important. This problem might well be regarded as a part of the first, namely, the determination of the exact value of geographic influences, but here applied to past events. "What we need," says Ellsworth Huntington, "is not to say that there is a relation, but to take specific areas and carefully work out the exact facts—expressed in numbers, if possible—which illustrate the connection of their history with their geography. For example, take such a state as Kentucky. One of the primary facts in its history seems to be its changing relation to three areas: (1) Virginia and the neighboring states in the early days when the main route to Kentucky was through the Cumberland Pass; (2) its relation to the South in the days when steamboats made the Mississippi a great trade route, and when the profitable raising of cotton created a demand for foodstuffs in the slave-owning states; (3) its relation to the great manufacturing states of the northeast and to the main trunk lines of railway which run north of it and not through it at the present time. If the geographers could take

problems like this and could work out the detailed statistics for a large number of relationships we should soon find that as a matter of course geography and history were regarded as going together in just the way that chemistry and physics are regarded."

"By the application of geographic methods and principles to history," says C. R. Dryer, "geographers, by extending help to the historians, would pay off a long score of indebtedness, strengthen the credit of their science and form an alliance which would contribute to the mutual advantage of geography and history."

Herbert E. Gregory would have geography solve the problem of "the history of man in regions where there are no written records and therefore where the only method of solution is geography," and Gilbert H. Grosvenor would apply this method of solution in "the study of ancient civilization in America." "This problem," he thinks, "will be solved not by an archeologist but by some able geographer who appreciates the problem from a broad geographic point of view."

Wallace W. Atwood also would have investigated "the influence of geography upon American history," for "studies in this field are enlarging our appreciation of the significance of geography and proving of great significance in the interpretation of history."

W. S. Tower, regarding as one of the chief needs of geographic investigation "the field where history and geography come into contact," thinks that "it is a line of research which is, perhaps, less likely to be developed as much as is desirable" because "in order to prosecute this investigation, the person engaged must be a highly trained man, both in history and geography."

Exploration should still be considered one of the great things requiring the attention of the geographer, six of the replies indicate. J. Scott Keltie places it as the most important. He says: "There still remains a very great amount of pioneer exploring work to be done. In South America there is probably a million square miles practically unexplored and much more that has been explored and mapped in a very imperfect and provisional form. Even in Canada there are still considerable areas that are practically unmapped. Africa may be said to have been explored and mapped provisionally so far as its leading features are concerned, but except in South Africa, in Egypt, in Algeria, to some extent in Tunis, in the Sudan and in portions of the British, German and French possessions in Central Africa, there is still a vast amount to be done before the continent is accurately mapped and its great

features known in adequate detail. In Asia, Arabia to a large extent still awaits the pioneer, and in Central Asia, Tibet and the regions around, there is still ample opportunity for the work of the pioneer, while in China, the Malay Peninsula and even in Persia, what mapping there is is mainly of a provisional character. As for the oceans only a fraction of them may be said to have been adequately investigated."

Alan G. Ogilvie thinks the important thing is re-exploration, rather than initial exploration. He says, "The amount of initial exploration which remains to be done is now small. What I will call re-exploration will become of the first importance and it should be undertaken by geographers with a sound general training and a natural geographical sense. Moreover, they must work hand in hand with the specialists, by assisting them to collaborate, and so supply their materials for the regional description in the most suitable form."

"Research in new lands," as given by George D. Hubbard, is evidently equivalent to Mr. Ogilvie's re-exploration. "The inter-tropical American lands," says Dr. Hubbard, "are probably our best openings aside from our own colonial possessions. They are not much occupied, unclaimed geographically, and but little known as to resources or topography; yet they are of growing importance to us as sources of raw materials, foods and markets." F. V. Emerson also regards exploration of our own continent as very important.

Robert E. Peary regards as the three things most needed: "(1) The geographical survey and scientific study of the entire circumference of the Antarctic Continent. (2) The establishment at the South Pole, and at Cape Columbia, less than 500 miles from the North Pole, of stations for a year of continuous systematic observations simultaneous with those at permanently occupied stations in America, Europe, and Asia. (3) The completion of the exploration of the unknown Arctic region between the Pole and Bering Strait, which MacMillan and Stefansson are at work on from this side, and which the Russians began on the Asiatic side by Captain Vilkitzky's discoveries north of Cape Chelyuskin last year."

Henry G. Bryant gives as two of the three important problems the investigation (1) of the large unknown area in the Arctic Ocean "with a view of determining the extent of the continental shelf, depth of ocean floor, force and direction of drift currents, and the existence or non-existence of land masses in the area re-

ferred to" and (2) "the continued systematic investigation of the Antarctic Continent."

Physical Geography. Only two replies give distinctly physiographic problems. W. W. Atwood sees a need for investigating "the physiographic history of the western Cordilleran Province of North America, a wonderful geographic province, which has as yet been studied in widely separated localities. The relationship of the various sub-provinces to the history of the province as a whole, opens one of the largest problems in physical geography on this continent, a problem distinct from any of the large problems in physical geography which have thus far been worked out."

N. M. Fenneman gives as a problem in physical geography, "To perfect and put into use as quickly as possible a genetic classification of land forms. This implies that regions already known should be described in those terms for the use of geographers and that other regions not so known should be studied in that light. The object of this would be to give the geographer good mental pictures with one-tenth of the reading now necessary."

Other Problems. Among other problems mentioned are: by H. H. Barrows, "the development of more effective methods of geographic description and interpretation"; by F. V. Emerson, "the development of common terms and concepts, *i. e.*, an increase and clearness of the terms used so that both writing and thinking shall be clearer"; by Mark Jefferson, "adequate expression of what is learned"; by L. W. Lyde, "the problem of correlating climatic phenomena, *e. g.*, the absence of ice in the Weddell Sea or off Spitzbergen to the subsequent failure of the Nile flood or the wet monsoons of India."

MODERN KOREA*

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Cattle Raising. In strong contrast to Japan no part of Korea is lacking in cattle. In the south and southeast the bullock is necessary to drag the plow through the thick, heavy mud of the rice fields. Every farmer has at least one work animal. So indispensable are the bullocks that at the time of a scourge that killed the beasts of burden the rice crop failed. When the animal can no longer work it is killed, its flesh is eaten, and its bones and hide are exported. While it is alive its excrement is used for fuel. So, alive or dead, the bullock is an addition to the farmer's wealth. Meat forms part of the diet of nearly all Koreans, even dog flesh being preferred to going without this kind of food. Hogs and dogs are public scavengers, so there is always plenty of pork and dog meat to be had. It is often stated that the Japanese do not eat meat. While it is true that Japan has not raised beef animals in her own territory, she has imported meat, and there is hardly an important town in all Japan that does not have it for sale. All the official and merchant class use meat, and some prefer it entirely to a diet of fish and rice. Since Japan began to control Korea she has satisfied her desire for meat by importing Korean cows, using them for work animals and then slaughtering them.[20] Recently she began to import Korean calves to fatten them with rice bran for the slaughter-house trade. The demand for meat is increasing in Japan. Korea can raise some of the supply which Japan lacks; therefore it is reasonable to suppose that cattle raising will become a more important part of the Korean farmer's activities. Already a Japanese company is promoting this industry in Korea. The live cattle shipped into Japan have come most largely from southern Korea because it was nearest.

Northern Korea also is a cattle-raising country. In that section the business is a more independent industry than in the south. There are many miniature plains in valley bottoms on which small herds of cattle are kept in numbers sufficient to cause a panic in southern Korea. There is much land also in the north that is

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* Concluded from pp. 756-769.

[20] *Commerce*, Jan. 15, 1914 (a Japanese trade association magazine published in Tokyo).

too hilly for any other use than grazing. The live animals exported from the north go to Asiatic Russia, but fat and bone, in the form of fertilizer, and the hides of the animals slaughtered in northern Korea all go to Japan. Here again is a business that is sure to increase. In Osaka, Japan, near Korea by water freight, there are seventy-seven leather factories whose annual product is worth $3,500,000. Japan cannot raise the raw material for these factories and has turned to Korea for the supply. The leather industry is as yet in its infancy in Japan, so with its growth will come a corresponding increase in cattle raising in northern Korea, for Japan's only other sources of raw material are India and the United States. She naturally prefers to buy from her own provinces, hence is encouraging cattle raising. A veterinarian has been established in each of Korea's political divisions to supply the needs and diseases of Korean cattle.

Although Korea has been raising cows for 3,000 years, dairying is not an industry. Milk, butter and cheese are unknown save to foreign residents, who import cheese and butter. There is little demand in Japan for these foods, so there is small likelihood of the immediate development of dairying in Korea.

Sheep Raising. Since so much of Korea is mountainous the question is often asked, why does Korea not turn her otherwise unproductive steep slopes into sheep ranges. In the south the mountain sides are either barren, or else covered with a coarse grass unfit for sheep food. Even if it were, it would not be fed to sheep, for it is far more necessary for fuel than sheep are for food or clothing. In the north the mountains are the lair of tigers, wolves and Chinese and Korean brigands, all of which would make short work of a sheepfold. The tigers are particularly dangerous. Even the villages of men must be protected by walls to keep out the beasts, yet every year the tigers take a heavy toll of human life. In the winter time when the tigers flounder helplessly in the snow, the villagers hunt them for their highly prized fur, but at all other seasons the tigers hunt the villagers. So between the lack of food in the south and the presence of beasts of prey in the north it is not surprising that in all Korea there are very few sheep.

Fisheries. A nation's food supply may come from the land by farming, or it may be taken from the sea by fishing. Japan is famous for making good a deficit in land food by an abundance of sea food. The waters surrounding Korea, especially off the east coast, abound in fish. Salmon, cod, sardine and herring[21] are the

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[21] British Consular Report, 1911.

most familiar varieties. Both fresh and dried fish find a ready market in Japan. On journeys in Korea, overland shipments of dried fish, carried on men's backs from the northeast coast peoples to the interior and south, are a familiar sight. Korean waters have attracted Japanese fishermen for ages, but Korean hostility prevented them from making settlements. Now there are a thousand Japanese fishing colonies of three to four men each, strung all along the Korean coasts. These Japanese fishermen offer the keenest competition to the Korean natives. Although the number of Korean boats and Korean fishermen are twice the number of Japanese the annual income of the Korean boats is only one-half that of their rivals. This is due to the ancient, inefficient craft and gear employed by the Koreans. They are being taught to use a better boat and more modern tackle. The whale fisheries are entirely in the hands of the Japanese, and this is an industry worth $4,725,000 a year.[22] The reason for Korean backwardness in fishing is the same as that for her crude agriculture, the lack of incentive to do more than was actually necessary in order to live.

Mining. Next to agriculture the most important industry in Korea is mining. The former Korean government frowned upon all attempts to develop the mineral resources of the nation, but in periods of stress was induced to grant mining rights to American and French companies. Gold is the chief mineral product. It is found along the central western coast and in the mountains of the northwest, and also at points on the east coast opposite the west coast operations. As yet the mining has been of the placer type, washing the gold from river sands, yet the gold export is equal to one-third the value of all other exports. Without the probable future increase in mineral production it is difficult to see how Korea would be able to make both ends meet, for there is a heavy balance of trade against her. The Japanese have opened the mineral rights and have codified the mineral regulations. Four of the largest gold mines are owned and operated by Americans. There is also one large French company. All told there are 240 gold mining rights, but for the most part the operations are small and primitive, and partake of the prospector type. Quartz mining has not yet begun.

Gold is the only important mineral product, but Korea is known to contain deposits of coal, iron, graphite, silver, lead and copper. Of these there is one fair-sized coal operation on the central western coast. The coal produced amounts to 110,000 tons a year,

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[22] Reforms and Progress in Chosen, 1910–11.

which is about one-third the output of the average American anthracite colliery. Although this coal field is insignificant, judged by our standards, it is far more important to a country so destitute of fuel as is Korea. The Korean coal is powdered anthracite and goes almost entirely to the naval briquetting station in Japan.[23] A few briquettes, manufactured on the coal fields, are sold in Korea. All the other minerals are as yet undeveloped. The iron ore must have been worked in former years, for there is an iron bell at Seoul, made from native ore, that is the third largest bell in the world. It was cast in 1396 and has hung in its present position since 1468. The signal for closing the city gates of Seoul is the ringing of this ancient bell. Korean tradition records that it was necessary to throw a living child into the molten metal to make it fuse, and that the wailing of this child is still heard in the tones of the evening curfew. There are indications of iron ore in many parts of Korea, but only as much as is produced in the least important American states is actually sent to Japan[24] and none is used at home. .

Manufacturing. Manufacturing on the factory basis is lacking in Korea. There are a few home industries supplying hats, paper, leather, tobacco and straw matting. Garments are also made by the housewives, but there is no such thing as factory organization. As long as Korea stays in the control of the Japanese it is probable that manufacturing will remain an absent quantity, except for a few supply industries which can be most economically carried on near their market. Japan is fast becoming a manufacturing nation. She has no desire to set up a rival in Korea. It seems to be Japan's intention to use Korea to supply the raw materials which Japan will manufacture and then resell to Korea if necessary. Korea has no real basis for manufacture except the presence of raw materials. Her population is not pressing upon resources to the extent of compelling a new method of gaining a living other than farming. Power for manufacturing is almost entirely absent. There is no wood for fuel except in the scantily populated north, and the wood is too valuable to be used as factory fuel. Unless new coal fields are discovered, there is not sufficient coal for power use. Due to the large amount of rain falling in the summer season, stream flow is too irregular to warrant the use of water power or the development of electricity.[25] Unless the great dif-

23 At Tokuyana.

24 $159,000 British Consular Report on Japan, 1912. Missouri produced $153,000 in 1911; Maryland and North Carolina $161,000 in 1911. (Mineral Resources U. S. 1911.)

25 Except at Gensan (Wonsan) on the northern coast.

ferences of tides on the west coast can be utilized for power, Korea lacks this fundamental for manufacturing. Korean labor is utterly lacking in mechanical ingenuity. The Korean people are too poor to demand manufactured goods. The Japanese market is supplied by her own mills, so Korean manufactures could not enter there. Cotton cloth is the only thing which could be sold in large amounts in the Korean home market, but Japan is able and anxious to meet this need by Japanese-made goods. So, for a long time to come, Korea seems destined to remain a producer of raw material, and not a fabricator.

Communications. As long as Korea remained an independent nation there was no development of internal communication. Each particular section remained nearly self-sufficient and, if crops failed, famine ensued. There were no railroads, no highways, no canals, no telegraphs nor telephones. All carriage of goods was on the backs of bullocks, ponies or men, and the man was the pack animal most often used.[26]

Railroads. The first railroad connecting the capital, Seoul, with its port, Chemulpo, was built in 1901 as a war necessity. American rails and bridges were used in the construction of this first short line, and American firms also supplied the rolling stock. The track was standard gauge, a fact which makes Korean railroads to-day surpass the Japanese system, for in Japan the British engineered the first roads and built them narrow gauge. Later, Japan made her own roads of standard gauge, and so had two systems side by side. This has caused endless delays, annoyance and trouble in through freight shipments which have to be unloaded and reloaded every time the gauge changes. Korea escaped this difficulty by starting with a standard gauge road and making each addition conform to the road first constructed. It is now possible to send one car without change from St. Petersburg (Russia) or Pekin (China) to Fusan in the extreme south of Korea. The second railroad soon[27] followed the first and was constructed for a similar military reason. After the Russian war the first work of the Japanese was to open the country. They were actuated most largely by military motives, but the economic advantage was not lost to sight. Railroads were the first necessity. All the chief ports are now connected, and a trunk line runs nearly the whole length of the peninsula. By building[28] a bridge three-

[26] The package carriers almost became a pack peddlers' guild and performed a valuable service in the dissemination of information from place to place. The Korean "coolie" is very strong and is known to have carried as much as 500 lbs.

[27] In 1905. [28] Opened for traffic Nov. 1, 1911.

quarters of a mile across the Yalu River in the northwestern part of Korea the trunk line put Korea in direct rail connection with the Trans-Siberian Railroad and the railroad systems of China.[29] The southern terminus of the trunk line at Fusan therefore becomes the true end of a world route. To accommodate the traffic that will come as a result of this line Japan is planning and executing a large improvement in the harbor of Fusan. Harbor

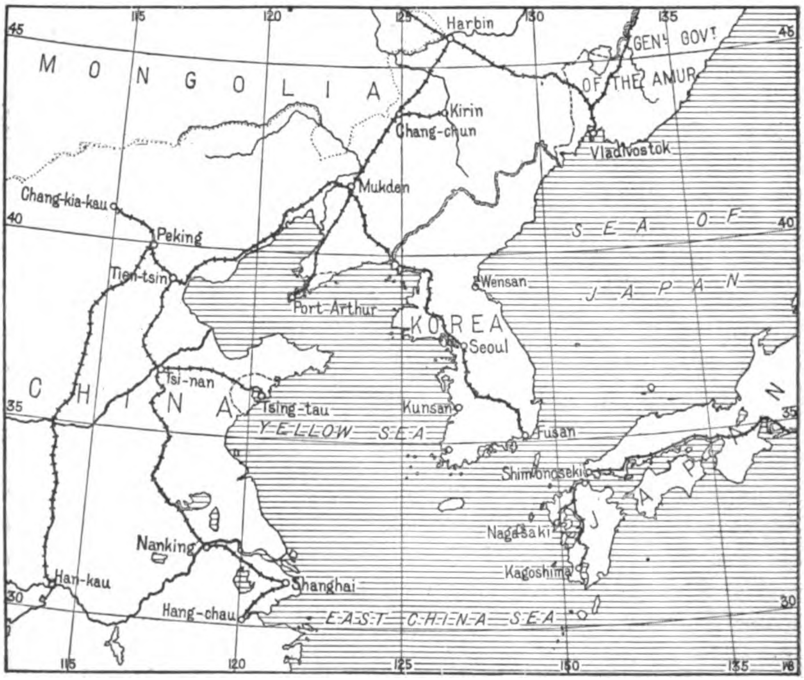

Fig. 4—Map of Korea, China and Manchuria showing the relation of the railroad system to Asia. See also Fig. 1: Map of Korea showing railroads, ports and cities (p. 757).

improvements are also in progress at the other great port of Korea, Chemulpo, in the center of the west coast, the port for the inland capital city, Seoul. On account of the shallow water off the west coast and the great tides and the silting of the harbor from the Han River, Chemulpo is to have the lock dock system.[30] Fusan on the south coast does not need this kind of harbor improvement.[31]

29 Total length of railroads in Korea, 1910, 767 miles. (Japanese Year Book.)

30 At present vessels must anchor three miles off shore and lighter freight to shore.

31 Progress in Chosen, 1911-12.

Fusan is only 120 miles from Shimonoseki in Japan and frequent ferry service has been established between the two cities, so the Korean railroad gives Japan, as well as Korea, a land connection with all Asia and Europe. The Korean system is operated under government ownership and all the employees except the track laborers are Japanese. At present the railroads are under the administration of the army, an amusing reminder of which is seen in the conductors' uniform, every one having a short sword much in the way, but highly ornamental and useful in striking terror to the minds of the easily frightened Koreans.

Street Railways. Seoul, the capital, has an electric street railroad, which was one of the first to be installed in the world. This road was built when many progressive American cities were content with busses. A Korean diplomat had visited this country and on his return home so filled his Emperor with wonder at the wagons which ran alone, that he forthwith ordered these mystical things to be made so he could see them for imself. In 1885 the Edison Company built an electric plant at the capital. The opening of the road to traffic brought many peculiar scenes, women offered sacrifices to the God of the Cars, and all along the route people fell down in worship. At night citizens used the rails for pillows, and lost their heads in consequence. So common did this become that signs were placed on all the posts along the right of way warning folk not to sleep on the tracks. The Japanese have improved this old line and have extended it to reach the suburbs beyond the walls of Seoul.

Highways. Next to railroads, Japan has sought to better highway communication. Beginning at the capital and the two chief ports she plans for a system of roadways extending over the whole peninsula. In a country so mountainous this is an expensive, difficult task. Five hundred miles of highway have already been built at a cost of $5,000,000 and 1,400 miles are under construction. Telegraph, telephone and postal communication have also been increased.

Commerce. The foreign trade of Korea is almost entirely with Japan. This has always been the case, but, since the annexation, the share of Japan in both imports and exports has increased. In 1912, 81 per cent. of the exports were sent to Japan and 60 per cent. of the imports came from that country.[32] The little

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[32] British Foreign Office Report, 1912.

import trade that Japan does not control is divided almost equally between the United Kingdom, China and the United States.[33] In a country undergoing rapid internal development it is not surprising that the imports far exceed the exports. The imports are almost entirely materials for railroad, bridge and roadway construction, agricultural improvements, and supplies for the Japanese garrisons, civil and police administrative works. The only imports of importance for the direct use of the Korean people are in cotton goods for clothing. That which Japan does not supply comes largely from the United Kingdom. The United States sells petroleum to Korea, in which we had a monopoly until the British Rising Sun Petroleum Co. threatened war. The Standard Oil Co. and this rival have now come to amicable agreement.[34] The United States also sells small amounts of flour to Korea. The exports are food products and raw materials which go to Japan.[35] The exports are valued at about $9,000,000, whereas the imports reach three or four times that figure. The difference is met by an export of gold bullion to the value of $3,000,000 to $5,000,000, and by loans without interest by the Japanese government to Korea. Although the revenue from Korea to Japan has increased from $3,000,000 in 1905 to $20,000,000 in 1910, it is hard to see just where Japan will get any financial benefit from Korea for a great many years to come. Although Korea offers room for the overflowing population of Japan and will eventually be of more economic importance, after all, the chief benefit which Japan derives from Korea is the strategic value of controlling a country which could threaten Japan's very existence were it in the hands of a hostile power.

Sociology

The Government. As long as Korea remained an independent nation the chief authority was vested in an emperor. He was advised by a cabinet of ten members, but the advisory group had no power beyond the mere preparation of resolutions and laws. Final decision upon all such matters rested in the emperor. Since the aristocracy had no choice of occupation but were expected to go into public office, the court of the emperor became very cor-

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[33]
Imports	Exports
United Kingdom, about 14 per cent.	China, about 16 per cent.
China, about 10 per cent.	Asiatic Russia, about 8 per cent.
United States, about 8 per cent.	

[34] British Foreign Office Report, 1912. The Standard Oil Co. supplies 80 per cent. of the oil import.

[35] Imports and exports as in footnote 33.

rupt, because positions were obtainable, not by ability or service, but by favor or bribery. A public berth gave power, through which sufficient force could be exerted upon lower officials or upon the common people to richly support the office holder. Therefore the nobility eagerly sought those posts that offered the greatest opportunities for extortion. The administration of the central government in consequence became exceedingly vicious. To become a governor of one of the thirteen "to," or provinces, into which the country was divided, meant that a chance to secure rapid wealth had been obtained. The result was that local government was also inadequate and unprincipled. In the provinces, and more particularly in their minor subdivisions, the very topography favored poor government. Hill and valley succeed each other in such disorderly array that the nation is an aggregation of nooks. During the period of the empire there was no communication between these corners of the country except through Chinese pack peddlers. There were no roads or any other means of transportation. Whatever happened in each little remote place was unknown outside. As a result the provincial officials could engage in the most nefarious practices and resort to the cruelest exploitation without detection or check. Taxes were made confiscatory. Industry and thrift were awarded by imprisonment, and the fruits of extra effort snatched away by fines and penalties. No man did more work than necessity required, or acquired more wealth than the moment demanded. Habits of shiftlessness, laziness and profligacy became fixed, and the name "Korean" became a by-word of reproach in Asia.

Evils in a nation, like depravity in a man, can exist longer if they be secret. Publicity in the first case, like exposure in the second, often induces reforms. After the annexation, means of communication were established in Korea so that places formerly remote and unknown became connected with the rest of the world. Corruption could no longer hide itself. With the changes in government and transportation, dishonest administration became less possible. The building of roads, telegraph and telephones, that open formerly inaccessible places, pave the way for better government at the same time that they enlarge economic opportunity.

The government at present is in the hands of Japanese military officers. The Korean people have no voice whatever in the administration. In order to overcome opposition, Japan has recognized the titles of nobility of the aristocracy of Korea and is planning to give the people representation in the Japanese parliament.

Courts. Korean courts were formerly administered in favor of the man with the most money. The laws are now being codified, the unspeakable prisons reformed, and the whole judicial procedure made to conform to the justice of the Japanese home courts. One case, involving many missionaries and Christian converts in the charge of conspiracy, has attracted the world's attention to see if the Japanese judicial procedure was more just in the government reports than in actual practice. The case has not yet gone up to the higher courts for decision.

Currency. The money of Korea used to be in a most chaotic state. Since 1905 a state bank has been established with branches at the principal centers, and savings banks have been opened.[36] The former brass nickel and cash currency is gradually being withdrawn and Japanese money substituted. The nickel was a filthy, slimy coin. Cash was said to be a compound of sand, iron and dirt and so low in value that the change from a $2 bill would load a donkey.

Language. The language of Korea, called Unmum, is a mixture of Mongolian, Tartar and Chinese. It is very symmetrical and capable of expressing the finest shades of meaning very simply. It contains many mimetic or onomatopœic words, and is a sonorous vocal language, with climactic sentence, *i. e.,* verb at end. The alphabet is derived from Sanskrit and has 28 letters. Since the influence of China was felt in everything in Korea, Chinese was the language of polite society and of writing in general. But since the annexation, Chinese has ceased to be the official tongue. The Japanese language has replaced both the Chinese and Korean for all official correspondence, and is being taught to the Korean children in Japanese schools by Japanese teachers.

Schools. Before the establishment of the power of the men from Nippon, schools that reached the mass of the Korean people could not have been said to exist; but now the whole school system has been placed on a new basis. Primary schools have been established in the provinces, and higher schools in the principal cities. The most important action, however, has been the establishment of trade and industrial schools, agricultural colleges and model farms and experiment stations. The boys and girls now sent to school have shown surprising ability to learn quickly and easily. They make accomplished linguists and clever mathematicians. The young men are eager to learn business so as to buy

[36] 1907, savings banks, 4,284 depositors; 1910, 25,632 depositors.

goods direct from the producer and so eliminate the Chinese or Japanese middleman.

Religion. There are four large religious bodies among the Koreans. The Buddhists are the oldest sect. Between the tenth and fourteenth centuries, Buddhism was the form of worship sanctioned by those in authority, but a change in dynasty brought a shift in official cult. Buddhism was replaced by Confucianism. The Buddhist priesthood are to-day a discredited, poor and corrupt body. Confucianism brings with it the worship of ancestors. The reverence for the graves of the forefathers has hindered modern progress in several cases. For example, the first railroad was surveyed to pass through a region devoted to graveyards. Where the graves concerned were those revered by poor people, money was able to give the railroad a right of way,[37] but where the tombs of nobility and especially of the sacred imperial family were involved, the railroad had to seek another, more inconvenient and expensive line. The cemeteries scattered thickly through the few lands best fitted for agriculture have limited the full use of even the little ground that is unencumbered by hills and mountains. Ancestor worship and Confucianism are distinctively an upper class religion.

The great mass of the common people are believers in Shamanism, whose essential is an acceptance of the power of demons. Since most of these are malignant, the Korean spends much time in propitiating the evil spirits. Sorceresses and blind sorcerers are the priests of the demons. In 1900 there were one thousand sorcerers in Seoul alone, and $750,000 was paid in fees to them by the poor Korean peasants.

The Christian church has been making many converts since 1895. Missionaries connected with the Presbyterian body have come into some ill favor because of their alleged sympathy and activity in the cause of Korean independence. The one blot on Japan's record, since annexation, has been the summary imprisonment and hurried trial and conviction of Christian converts said to have been involved in a treasonable plot. The case is not settled yet, for it has gone over to the superior courts of Japan for retrial.

The readiness with which the Koreans accept Christianity may be explained on several grounds. Missionaries and others who have had a chance to know the people well, all comment on the fact that the Koreans adapt themselves to northern Europeans

37 In twenty-six miles, 2,000 graves were bought at $1–$3 a grave.

and Americans more readily than do the Chinese and Japanese. It is easier to forget the difference in race with the Korean. The long years of oppression, under which the people suffered, prevented the development of the spirit of a strong nationality, and made them comformable to new influences more readily than if they had acquired a dominant national personality. The Christian religion, in its insistence on humility and its offer of hope to those wronged by tyranny, makes an especially strong appeal to the downtrodden; so the growth of Christianity among the Koreans is not surprising.

The People. The Korean people[38] are an excellent illustration of the influence of environment on character. In the northeastern part of the country the surface is much broken, agriculture is difficult, the winter climate is severe and the danger of attack from wild animals and bandits always imminent. The rigorous

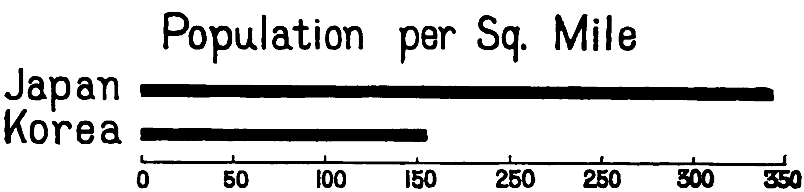

FIG. 5—See also Fig. 1 showing distribution of population in Korea (p. 757).

livelihood has caused a natural selection of vigorous manhood. The northern Koreans are industrious, brave, aggressive and progressive. Unfortunately for the reputation of the nation, this section has been little visited by foreigners, and the number of people living there is relatively small. Outsiders have come most in contact with the greater mass of people who live on the low, constricted coastal plains of the southwest. In that region the surface is less dissected, climate is softened by the presence of the warm Yellow Sea, food is easily obtained, and the danger of outside attack very much lessened. The people are not hardy, nor courageous, nor diligent. The world has formed the opinion that Koreans are cowardly, lazy, and dirty. They lack spirit because long years of injustice taught them the futility of resistance. Their word for work is "loss" or "misfortune" because the fruits of labor never enriched the laborer but swelled the income of the tax gatherer. They are dirty because they crowd into huts in too

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[38] The number of people is variously estimated, but is generally conceded to be 13,000,000. The foreigners in Korea at the latest estimate are Japanese, 242,028; Chinese, 15,909; Americans, 565; British, 197; others, 211.

close proximity. The huts always remained small, because to increase the size of the dwelling was an indication of wealth, which invited imprisonment and extortion. Under protection, the Koreans are industrious, energetic, faithful and reliable.

The typical Korean is well built and taller than the average Japanese. The height of the men is accentuated by a high crowned horsehair hat and loose flowing garments. The whole population dresses in white or what was once white. The explanation of this universal custom is twofold, first the prosaic one, that Koreans have never learned the art of dyeing cloth. The traditional solution is that white is the badge of mourning in Korea. When a man's father dies, the man must wear white for three years, and if in the interval the mother also is lost, he must continue to wear white for three years after the expiration of the period of mourning for his father. If a member of the imperial household met with misfortune the whole nation was forced to wear white for seven years. It is supposed that a series of disasters in the royal household caused the people to wear white for so long a time that it became a custom.

The women have a peculiar garment resembling a cloak, with sleeves attached, which they wear over their heads and shielding their faces. This cloak is a mark of honor, for the story runs that once when the Emperor, unawares, had summoned a number of traitors to dinner, who planned to assassinate him during the meal, the women, learning of the plot, went to the palace, and concealing their heads in the officers' cloaks left in the hall, warned the Emperor of his danger. As a token of gratitude he decreed that the women should wear the cloaks always.

Women are treated as slaves. After marriage, which takes place at a very early age, they are confined to private apartments and not allowed to converse with the husband's guests. Concubinage is common. At the meals the men always eat first, and the women take what is left.

Food is eaten with great gusto; the more noise accompanying the eating the greater is the compliment to the cook. It is said that a mother will feed her boy all he can eat, then crowd more down his throat and tap him on his stomach to settle it. She then lays him on his back and fills him full. The whole nation overeats, and consequently nearly everyone suffers from dyspepsia and indigestion.

The houses have stone or dirt floors and are heated by flues from the kitchen passing under the floor. Outside the house is a

ditch where offal and refuse are allowed to lie and rot in the hot sun, or to drain into the well. In the hottest months the whole city is one reeking cesspool, so dysentery, cholera, typhus and typhoid rage.

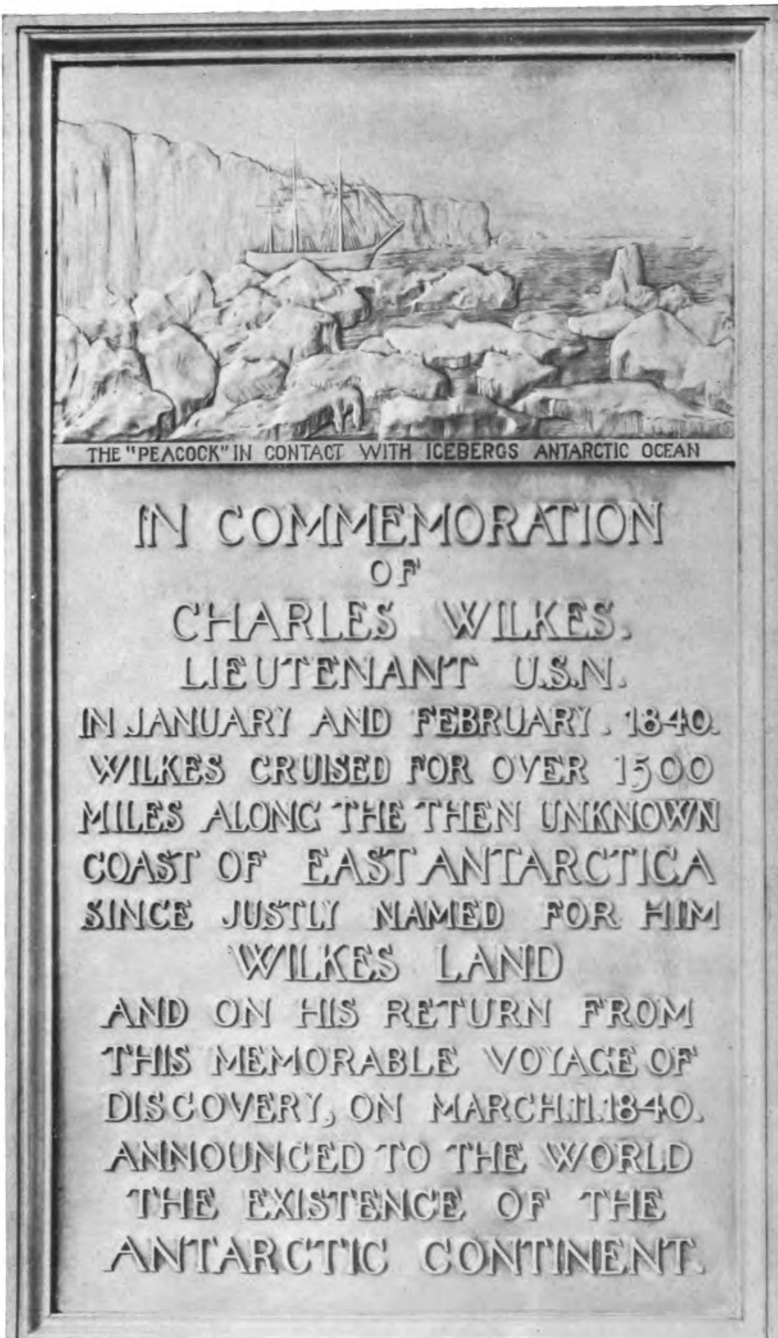
Conclusion

From the study just made it would seem that it was the political importance of Korea, rather than the economic advantage to be obtained, that actuated Japan in her desire to possess Korea. The country is in a strategic position in Asia, and although her future seems settled in whatever happens in the Far East in the time to come, Korea will have an important share of attention.

TABLETS IN MEMORY OF WILKES AND PALMER

Photographs of two bronze tablets that were placed, last summer, in the lower hall of the Society's house are here reproduced. These tablets, each 39 by 17 inches, were designed and made under the initiative of Councillor Edwin Swift Balch and the direction of Councillors Balch, James B. Ford and Grenville Kane, with the hearty approval and support of the Council. They commemorate distinguished contributions to Antarctic discovery by two of our countrymen: Lieutenant Charles Wilkes, who, cruising in 1840 for 1,500 miles along the coast of East Antarctica, in a vessel badly equipped, propelled by sail and almost unseaworthy, recognized the fact that he was facing the coast of an enormous land and named it the Antarctic Continent; and Captain Nathaniel B. Palmer, who is believed to have been the first to sight that part of Antarctica which lies nearest to South America and after whom Palmer Land in West Antarctica and the neighboring Palmer Archipelago were named.

Wilkes's hazardous voyage over an ice-strewn sea in high southern latitudes where gales, even in summer, are terrific was a very remarkable achievement. He found land which has been rediscovered by the Mawson expedition. Doubtless he sometimes mistook stretches of lofty ice wall for land. His sailing vessel *Vincennes* was not easily manageable in a stiff gale and he was often compelled to stand out from the ice or risk the destruction of his ship;


THE "PEACOCK" IN CONTACT WITH ICEBERGS ANTARCTIC OCEAN
IN COMMEMORATION
OF
CHARLES WILKES,
LIEUTENANT U.S.N.
IN JANUARY AND FEBRUARY, 1840.
WILKES CRUISED FOR OVER 1500
MILES ALONG THE THEN UNKNOWN
COAST OF EAST ANTARCTICA
SINCE JUSTLY NAMED FOR HIM
WILKES LAND
AND ON HIS RETURN FROM
THIS MEMORABLE VOYAGE OF
DISCOVERY, ON MARCH 11. 1840.
ANNOUNCED TO THE WORLD
THE EXISTENCE OF THE
ANTARCTIC CONTINENT.


PALMERS LAND AS SEEN FROM THE SOUTH SHETLANDS
IN COMMEMORATION
OF
NATHANIEL BROWN PALMER
MASTER MARINER
AND
INTREPID EXPLORER
IN 1820-1821, PALMER PROBABLY
FIRST SIGHTED THE MAINLAND OF
WEST ANTARCTICA
AND CERTAINLY FIRST SAILED
ALONG A STRETCH OF ITS
COAST, AND THIS WAS
RIGHTFULLY NAMED FOR HIM
PALMER LAND.

but the long fore-front of ice wall, glaciers and icebergs could mean only that the continental coast which gave them birth lay behind; Wilkes recognized the fact that he was skirting the edge of a continental land mass and he called it the Antarctic Continent. "Wilkes's modesty," as Mr. Balch wrote in 1912, "prevented him from attaching his own name to his discovery, an omission which the sense of justice of historical geographers has fortunately rectified." As Dr. W. S. Bruce wrote in 1912, "Anyone who has carefully read Captain Wilkes's narrative must have felt that there was sufficient evidence for the American discoveries, and the writer, for one, has always upheld the view that those lands would be found to exist more or less in the position in which Wilkes charted them. The Mawson Australasian Expedition has proved, over a distance of more or less 1,200 miles, the existence of Wilkes Land, which has been disputed during the past seventy-two years, and has set up stations at the west and almost at the east end of it." On the Antarctic maps now produced by most of the map-making nations the name Wilkes Land appears.

The name Palmer Land also appears on most charts of that part of Antarctica south of South America. The name is printed in its correct place when it is shown on the north shore of the northern mainland of West Antarctica, as on the maps of Dr. Jean B. Charcot, the French Antarctic explorer. The mainland of West Antarctica, as far as the records show, was first sighted by Nathaniel B. Palmer of Stonington, Conn., and the land was named after him possibly by the Russian admiral and Antarctic circumnavigator Bellingshausen.

The American Geographical Society believes it to be eminently fitting that the great work of Lieutenant Wilkes and the notable achievement of the young Stonington sealer, Palmer, should be commemorated on its walls by these handsome tablets.

THE OPENING OF THE CAPE COD CANAL

On July 29 the Cape Cod Canal was opened to traffic. By this important undertaking the sea route between Boston and New York is considerably shortened.

The canal severs the long hook "arm" of Cape Cod at the shoulder and leads from the head of Buzzard's Bay in an east-northeast direction into Cape Cod Bay. Its course lies through a natural depression in the moraine, which was already followed by the railroad from Boston to Provincetown. Its length from bay to bay is 7½ miles; the greater part of this distance was occupied by natural drainage, only about one mile consisting of higher ground, with a maximum height of 29 feet. Approach channels have been dredged, one 5 miles long on the Buzzard's Bay side and the other half a mile long on the Cape Cod Bay side, thus making the total length of the canal 13 miles. There is a breakwater 3,000 feet long on the northern side of the Cape Cod Bay end. The canal prism, in its typical cross-section, is 100 feet wide at bottom, 220 feet wide at the top and 25 feet deep at mean low water. The top and bottom widths are greater in the approaches and in two passing places within the canal proper. The canal is a sea-level canal. The difference in tide height between the two ends of the canal is at no time more than 5 feet, so that there is no obstacle on the score of currents. The maximum velocity, 3 miles an hour, cannot last for more than half an hour, and is therefore negligible. The canal is accompanied for the greater part of its length by a highway on each side and, in addition, on the southern side, by the Boston-Provincetown railroad. It is crossed by three lift bridges, one carrying the railroad and the two others highways. The canal is illuminated throughout its length on the street lighting plan.

The canal affords a route considerably shorter and safer than the existing route between New York and Boston, which goes up Long Island Sound and passes through Vineyard and Nantucket Sounds around Cape Cod to Boston. The new route is coincident with the old as far as Pt. Judith; from here it diverges and ascends Buzzard's Bay, passes through the canal into Cape Cod Bay and then skirts the coast of Plymouth County to Boston. The distance from New York to Boston around Cape Cod is 334 statute miles; via the canal, 272 miles[1]—a saving of 18½ per cent. But shortening of distance is not the only advantage gained: the canal route will afford protection from the risks of the outside route. Storms and fog have given this region its name of "the graveyard of ships." In the last fifty years the number of vessels wrecked here has averaged, it is said, thirty-five a year. The fog records for Pollock Rip, off the "elbow" of Cape Cod, during 1909, 1910 and 1911 average 1082 hours of fog per annum; the corresponding values for the western and eastern entrances of the canal were respectively 277 and 564 hours.

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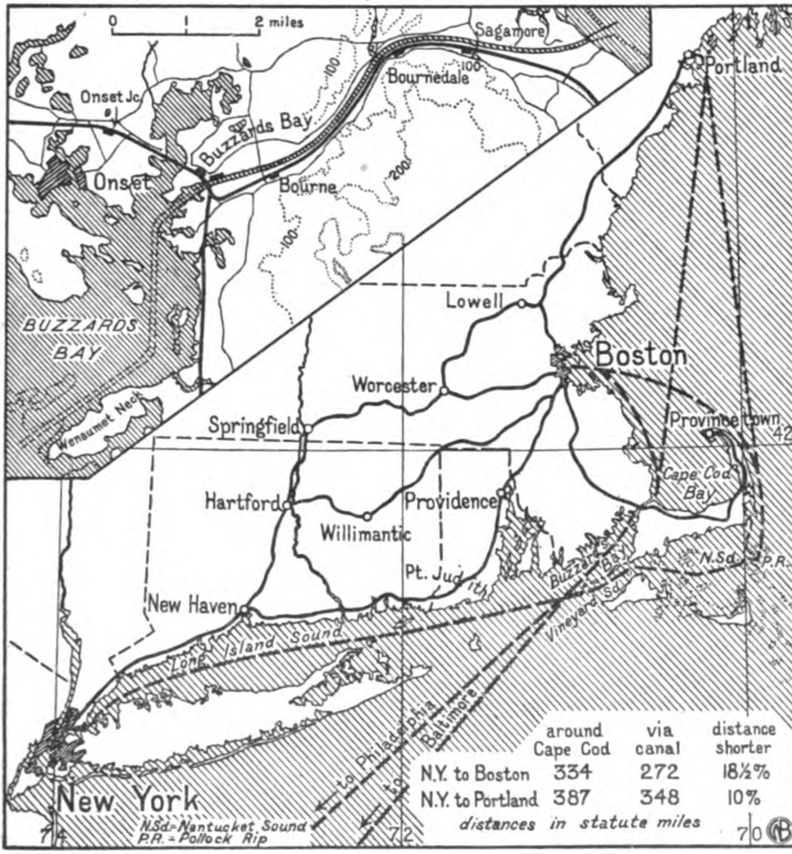
[1] The distances given in publications on the canal frequently vary. The distances given here and in the subsequent table are based on measurements made on U. S. Coast and Geodetic Survey charts Nos. 6, 7 (now 1107), 8 (now 1108), 112 and 1000, or are taken from "Table of Distances in Nautical and Statute Miles via the Shortest Navigable Routes," *U. S. Hydrographic Office Publication No. 117*, Washington, 1912.

The commerce passing around Cape Cod is estimated at 25,000,000 tons annually. This consists mainly of raw materials, coal and lumber predominating. The carriers are mainly towed barges and cargo steamers. The average speed of the barges is seldom more than 4 or 5 miles an hour. As a 3,000-ton barge—commercially the most advantageous size—can pass through a 25-foot canal at 10 miles an hour without damage to the canal prism, this class of traffic will suffer no delay from having to slow down. By using the canal, the



Alternative routes available between New York and New England ports since the opening of the Cape Cod Canal. Scale, 1:3,600,000. The through railroad lines between New York and Boston or Portland are also shown.

The inset shows the canal in detail, based on a map kindly supplied by the Cape Cod Construction Company.

barges with West Virginia coal plying between Newport News and Boston will, it is said, save enough time to make twenty-seven instead of the usual twenty-four trips a year each way. It is naturally this freight traffic which is mainly expected to use the new route opened up by the canal; nevertheless passenger travel may be affected by it. The main routes that come into consideration are

between New York and Boston and New York and Portland, the former operated by the Metropolitan Steamship Line, the latter by the Maine Steamship Line, both of which are subsidiaries of the Eastern Steamship Corporation; and between Chesapeake Bay ports (Baltimore, Norfolk, Newport News) and Boston and Philadelphia and Boston—lines all operated by the Merchants and Miners Transportation Company. On inquiry, the Society is informed by these two companies that their vessels are not as yet, however, making use of the canal. The comparative distances, in statute miles, on these routes outside of Cape Cod and via the canal are summarized in the following table:

	AROUND CAPE COD.	VIA CANAL.	DISTANCE SHORTER.
New York—Boston	334	272	18½%
New York—Portland	387	348	10
Philadelphia—Boston	547	489	10½
Norfolk—Boston	593	535	10
Newport News—Boston	594	536	10
Baltimore—Boston	736	678	8

The construction of the canal—an undertaking which was discussed as early as 1697 by the General Court of Massachusetts, and whose strategic value was urged by Washington during the Revolutionary War—was carried out by a private company, the Cape Cod Construction Company, agent for the Boston, Cape Cod and New York Canal Company. It took seven years to build and cost $12,000,000. The Society is indebted to the company for much of the information here presented and for the gift of a detailed map of the canal, from which the inset on the accompanying map has been prepared.

GEOGRAPHICAL RECORD

NORTH AMERICA

Coal Mining Breaks all Records. The Geological Survey reports that the United States coal output for 1913 was 570,048,125 short tons, which is more than double the production of 1900 and more than eight times the production of 1880. The value of the coal mined in 1913 is given as $760,488,785. Twenty-three of the twenty-nine coal producing states show increased production and only six decreased production. The decrease in Colorado was due solely to labor troubles. Of the states showing increased yield twelve made record production and Pennsylvania broke records in both bituminous and anthracite output.

The International Exposition at San Francisco. President Charles C. Moore, of the Panama-Pacific International Exposition, announces that events have proved the wisdom of the official decision not to postpone the opening of the exposition. Assurances have been received from France, Italy, Turkey and Japan that they will participate as promised. The Netherlands have added $300,000 to their original appropriation. Italy is erecting its building. The Exposition will lose some of the promised exhibits from Europe, but by no means all of them. Both Germany and Great Britain will be represented by individual exhibitors or by associations. There is a large demand for space from the manufacturers of this country, of South America, and of the European nations not at war. Ninety-two per cent. of the work of preparation for the opening is completed and the formal opening will occur on Feb. 20 prox., as promised.

Deep Boring at Spur, Texas. In the northwest part of Texas, east of the Pecos, the formations are nearly horizontal. This structure persists over the entire plains from the north end of the Panhandle to a line joining San Angelo and Pecos on the south. The area extends 330 miles from north to south, 170 miles from east to west and covers a fifth of the area of the state. It is fortunate for our knowledge of the stratigraphy of this region that a deep boring has been made not far from the central part of the area. Some large land owners in search of water for the town of Spur carried out the enterprise. Unfortunately for them, water was not found and the hole was abandoned in November, 1913, at a depth of 4,489 feet. The strata explored by the boring consist of three well marked divisions. The upper 1,250 feet are red sands, clays, marls, beds of gypsum, anhydrite, and salt in different degrees of purity and intermixture. Three beds of pure salt, ten, five and nine feet in thickness, lie between 570 and 741 feet below the surface. The succeeding 2,850 feet consist of dolomite with strata of anhydrite, sandstone and shale. The lowest 289 feet consist of limestone and shale. (Condensed from *Bull. Univ. of Texas No. 363*, 1914.)

Lectures on the Climatology of the Eastern Hemisphere. The programme of the Department of Geology and Geography of Harvard University includes this year, for the first time, a course of about forty lectures on the climatology of the Eastern Hemisphere. This course, listed as "Meteorology 5," is parallel with two other half-courses on the climatology of North America ("Meteorology 3") and on the climatology of South America ("Meteorology 4"), respectively. The object of the new course, which is designed particularly for students of geography, botany and history, and for others who wish to gain a general view of the climatic factor in the physical environment of man in the Eastern Hemisphere, is to sketch in outline the

controls and broader characteristics of the climates of that hemisphere with special reference to the relations of these climates to human life. The broader geographical features are discussed as a basis for the study of the climates. The larger controls of climate over population, habitability, history, crops, occupations, travel and transportation, and health are considered, rather than the minuter details of the local climates. During the present winter the influence of the weather upon military operations in Europe will receive special attention. With the addition of this new course to its list, Harvard is now able to offer its students instruction in the climatology of all parts of the world. These courses in climatology are given by Professor R. DeC. Ward.

Publications of the Weather Bureau. A change in certain of the publications of the Weather Bureau began on Jan. 1, 1914. The *Monthly Weather Review*, which, since July, 1909, has contained comparatively few papers of general interest, being chiefly a collection of climatic data, has now returned to something of the scope and character which it had before that time, and which gave it a well-recognized position among the meteorological journals of the world. It was, in fact, recognized as representing American meteorology, although the *American Meteorological Journal*, from 1884 to 1896 did a most valuable work along somewhat similar lines. No one in this country could be found so well equipped for the position of editor of the new *Monthly Weather Review* as Professor Cleveland Abbe, the mainstay of American meteorology for nearly fifty years. Professor Abbe brings to his task a rich store of meteorological and physical knowledge which long experience and diligent labor have given him.

Coincident with the change in the character of the *Monthly Weather Review* came the suspension of the *Bulletin of the Mt. Weather Observatory*, established in 1907, and since then devoted to the more technical meteorological papers. The new *Review* is arranged in six sections, dealing respectively with aerology, general meteorology, forecasts, rivers and floods, bibliography and weather of the month. It is safe to say that this publication, which will hereafter contain also such technical studies as have been appearing in the *Bulletin of the Mt. Weather Observatory*, will be indispensable to all workers in the science of the earth's atmosphere. R. DeC. Ward.

Variations in Rainfall in California. A study of the variations in rainfall in California, made by William Gardner Reed, of the University of California, and presented at the meeting of the Cordilleran Section of the Geological Society, April 11, 1913, was published in the *Monthly Weather Review* (Nov., 1913). The period covered is 1880-1910. The number of stations is about thirty; the object of the inquiry was to determine the relations of wet and dry periods and to ascertain whether a periodicity of wet and dry seasons exists. That the seasonal precipitation for stations in California varies widely has long been well known, and, in some instances, there is a correspondence of dry and wet seasons in different parts of the state. The author's general conclusions are: (1) the amount of rainfall in California varies within wide limits; (2) in a general way, the variation is similar in character but not in amount throughout the state; (3) variations more or less similar in character and amount are to be found in each of four districts for which data are available; (4) the period of oscillation of the seasonal amounts is longer south of lat. 35° N. than north of it; (5) the "wet" year, 1889-90, and the "dry" year, 1897-98, were nearly or quite state-wide; (6) careful analysis of the data, and a rigid treatment of the results, are necessary before safe conclusions can be drawn regarding oscillations in California rainfall. Mr. Reed's study is one of a type which should be carried out in each state. The more such details of rainfall are studied, the more we shall be in a position to correlate crops and rainfall, and the more effective and practical will become our climatological knowledge. R. DeC. Ward.

The Weather and the Corn Crop. Investigation of relations between weather and crops, especially such as help towards a forecast of the

probable crop yield on the basis of weather conditions previously noted, will always have great economic, as well as purely scientific interest. Professor J. Warren Smith, of the U. S. Weather Bureau, stationed at Columbus, O., has studied "The Effect of Weather upon the Yield of Corn" (*Monthly Weather Review*, Feb., 1914), and finds that the controlling weather factor is rainfall. It is noteworthy that "the critical point of growth of corn during which favorable weather will cause a large crop, and unfavorable weather a short crop, is comparatively brief." July rainfall has much more effect upon the field of corn than that of any other month, and the rainfall from mid-July to mid-August is more critical than that for any other period of equal duration. The larger the rainfall for the ten days following the date of blossoming, the larger the yield, and if the rainfall is small during these ten days a high temperature has a very unfavorable effect. Careful study of weather conditions up to August 10 makes possible a close estimate of the probable yield of corn. Rainfalls of one-half inch or more are more important than falls of less amount.

R. DeC. Ward.

Forest Fires and Weather Forecasts. Forest fires are one of our most serious problems in connection with our national conservation policy. Forest fires depend very largely upon weather conditions. Therefore, forecasts of weather which is favorable for the occurrence and spreading of such fires should be of great value in enabling us more successfully to prevent and check them. Mr. E. A. Beals, District Forecaster of the Weather Bureau at Portland, Ore., has made a study of "The Value of Weather Forecasts in the Problem of Protecting Forests from Fire" (*Monthly Weather Review*, Feb., 1914). Our largest and most destructive forest fires occur with prevailing cyclonic winds over a large area, but as most of our standing timber is in mountainous districts, mountain and valley winds become important controls. The author has selected four great forest fires for special detailed study, in order to see whether the winds might not have been forecasted far enough in advance to have made possible a more effective fight against these disasters. Numerous weather maps illustrate the weather conditions preceding and accompanying these fires. Strong winds, just before, during, and a short time after the fire passes a given place, are among the most striking features. The weather maps show no conditions sufficient to cause extraordinary winds, and the conclusion is that the fires themselves produced them. The velocity of such winds cannot, however, be predicted by a forecaster, for that depends upon local conditions, the size of the fire, etc. The general conclusion is that much assistance may be gained by an intelligent use of the facilities offered by the Weather Bureau, "but where forests are situated near the sea, or in a mountainous country, there are so many local controls to wind movement that much will have to be left to the man on the ground." R. DeC. Ward.

Through Passenger and Freight Service on the Grand Trunk Pacific. Through service on this new transcontinental railroad began in the second week of September. Track-laying was completed in April last, but through service was delayed for several months in order to place the road-bed and bridges in first class condition. Prince Rupert, the Pacific terminus of the railroad, is now in direct rail connection with eastern Canada and the United States. A new avenue of commerce has been opened to Canadian agriculture and industry.

Geology of Bermuda. Mr. L. V. Pirsson, Professor of Physical Geology in the Sheffield Scientific School, Yale University, has a paper in the *American Journal of Science* (Vol. 38, September, 1914, pp. 189-206) on the geology of Bermuda as revealed by a deep boring recently sunk by the owners of the Princess Hotel who hoped thereby to secure additional supplies of fresh water. This hope, of course, failed to be realized and the bore hole was abandoned after it had been carried down to 1,413 ft., where it terminated in solid lava. The paper includes a diagram of the boring showing a geological section, from which it is seen that three zones of essentially different materials

were penetrated. First were the soft, chalky Bermuda limestones; second a layer of soft oxidized volcanic matter, yellow to brown in color; and third, fine compact lavas, dark gray in color, which persist to the bottom of the boring. The limestone is soft above sea level, somewhat harder below it and extends to a depth of 380 feet. The zone of oxidized material ends about 600 feet below the surface. Professor Pirsson suggests that this oxidized material represents the product of land waste. If this theory is admitted, the conclusion follows that Bermuda was once an island composed of volcanic rocks rising above the level of the sea which has been entirely cut away by the erosive action of the waves. At the bottom of the boring and up to 700 feet, lie the original lava flows which built up the cone, unoxidized because the rocks had been protected by the sea from the work of the atmosphere.

"Bermuda Island has been thought to be situated upon the apex of a volcanic mountain mass, and Verrill has made some suggestions as to its size, slopes, and probable history, but until the present boring was undertaken, there have been no direct facts which would prove this. Other than the statements and suggestions of Verrill, so far as the writer is aware, there has been no attempt made to consider its form and size in this connection. It would seem of interest to do this to obtain some data for comparison with other volcanic masses of a similar nature and situation."

A sketch map of the Bermuda volcanic mass is introduced. This indicates that, on the sea floor, the volcanic base on which the islands and the neighboring Argus and Challenger Banks stand, extends in a northeast and southwest direction some 90 miles as an elongate ridge whose greatest breadth may be some 25-30 miles. At the sea level it has been cut away to a platform which at the 100 fathom line has a length of about 32 miles and a width of 16 miles. Southwest of it are the Argus and Challenger Banks, rudely circular in shape, about 5-6 miles in diameter and the same distance from each other and four miles from the main platform. It seems clear that they represent subordinate volcanic cones that have also been cut away by action of the sea.

If it is assumed that the main platform represents the truncated top of a single volcanic peak and if the profile is continued upward by the dotted lines, which Professor Pirsson shows in Fig. 2, then this peak, he estimates, would have risen 11,500 feet above the present sea level or about 26,000 feet above its base on the sea floor. This compares with Hawaii, whose peak reaches a height of 30,000 feet above the ocean bottom, and Samoa, 25,000 feet. It is quite as probable, however, that this platform was cut through several coalescing volcanic cones and in this case the height would not have been so great. Dr. Vaughan says it appears safe to assign an Eocene or pre-Eocene age to the Bermudian volcanic activity. Professor Verrill, of Yale University, suggests that the volcano was completed or formed during the Triassic or at its close and correlates it with the igneous outflows which marked this period along the North American coast. Professor Pirsson comments that the volcano may date from Triassic time, "but it should be observed that the diabases of the Triassic are a feature of the border of an entirely different earth-segment from the one on which the Bermuda volcano is situated, one which has had a very different geological history and that they made their appearance while the region was undergoing tectonic movements of which we have no knowledge in the Bermuda area."

CENTRAL AMERICA AND WEST INDIES

Official Opening to Traffic of the Panama Canal. Commercial traffic between the Atlantic and Pacific Oceans through the Panama Canal was inaugurated on Saturday, Aug. 15, by the Government steamship *Ancon*, which made the trip from the Atlantic to the Pacific in approximately nine hours. The *Ancon* carried, as guests of the Secretary of War, about 200 persons. Eleven commercial vessels passed through the canal on the following day and also the Peruvian torpedo destroyer *Teniente Rodriguez*, the first war vessel to use the waterway.

ASIA

Padre Murillo Velarde's Map of the Philippine Islands, 1734. In an article published in Paris in the *Bulletin géographie descriptive and historique,* for 1897, Mr. Gabriel Marcel called attention to a rare and important map of the Philippine Islands, compiled in 1734 by Padre Murillo Velarde. Only two copies preserved in the Bibliothèque Nationale at Paris were known to Mr. Marcel. One of these only is perfect. Fortunately, there exists another complete and perfect copy in the Division of Maps and Charts of the Congressional Library at Washington.

The importance of Velarde's map is that it may be regarded as the most successful attempt of the time correctly to delineate the Philippine Islands. It was compiled from actual observations and the best data attainable. It was engraved at Manila by a native artist, as is shown by the following inscription found in the lower right-hand corner: "Le esculpio Nicolas de la Cruz Bagay Indio Tagalo in Man - la - ano 1734." Regarding this Filipino engraver, we find in a work entitled: "Noticias sobre la imprente y el grabado en Filipinas," published at Madrid in 1893, by Dr. Pardo de Tavera, that he was "a Tagal Indian, a printer and an author, who seems to have been the most expert engraver and topographer in Manila." De La Cruz also engraved in 1744 a reduced copy of Velarde's map of the Philippine Islands, a copy of which is also preserved in the Library of Congress.*

Mr. Marcel says that Padre Velarde was born at Villa de Laujar in 1696, entered the Society of Jesus in 1718, and soon left for the Philippines, where he was successively professor of theology and law at Manila, rector of Antipolo and inspector of missions at Mindanao. He was a very learned man, who devoted himself to the study of the Indian languages and was fond of historical and geographical studies, as is shown by his History of the Philippines, and an historical geography in ten volumes, published at Madrid from 1752 to 1762. With reference to the origin of the map, Padre Velarde informs us in the *Sentir,* which he wrote for the Chronicle of Juan de San Antonio: "In 1733, I was ordered by His Catholic Majesty, to compile the map of these islands, and I published it in 1734. In it, I marked as many of the villages, capes, bays, harbors, rocks, straits, rivers, forts, distances, as I could, considering the scale of the map and the difficulty of the undertaking."

The map is on two large sheets, measuring each 43 x 14 inches; the lateral bands, 43 x 9½ inches each. In the lower left-hand corner a cartouche gives a short account of the government of the Philippines, with statistics of 142 villages. To give an idea of the commercial and naval activity of the Philippines, Padre Velarde scattered over the waters numerous pictures of vessels of various sizes and types, the routes followed by the galleons being indicated by means of double lines. Numerous names of capes, bays and rocks, as well as the names and location of tribes, provinces and villages are given. In "Nueva Castilla o Luzon," three of the largest rivers are delineated in their entire course, the "Rio Tajo" flowing northward, the "Rio Grande" and "Rio Chiquito" flowing into Manila Bay. Among the various tribes located on the map are the "Ygrotes gentiles, Calingas gentiles, Negros gentiles in the island of Luzon." In Mindoro island, we have the "Manguiares gentiles." This early authentic geographical nomenclature is of interest, and makes Padre Velarde's work a document of much import in the historical geography of the Philippines.

The illustrations in the two lateral bands give characteristics views of the natives and their country. The band attached to the right margin contains, besides two pictures, a map of the island of Guam, entitled: "Ysla de Gvajan," showing Agaña, Asan, Pago, Merizo and other towns; a detailed plan of Manila, showing the old city walls with cannon, the quarters reserved for natives, and twenty-six reference numbers referring to important buildings and places, among them being old Fort Santiago, the Cathedral, destroyed by an

*This admirable, reduced reproduction by De La Cruz of Padre Murillo Velarde's map (36 x 21 inches), in colors, is included in the Atlas van Homan, 1760, and is in the collections of the American Geographical Society.

earthquake in 1863, the "Sto. Domingo" Convent, etc.; a map of Samboagan, which is the earliest one known to have been drawn on so large a scale; and a well-executed plan of Cavite. Mr. Marcel characterizes Padre Velarde's map as "a contribution to the artistic history of the Tagals, one of the rarest productions of the Philippines, and a cartographical monument of great rarity, almost unique."

O. Welti.

AUSTRALASIA AND OCEANIA

German Men of Science Detained in Australia. Dr. A. Penck, professor of geography at Berlin; Dr. F. von Luschan, professor of anthropology in the same institution, and Dr. J. Walther, professor of geology and paleontology at Halle, accepted invitations to attend the Australian meeting of the British Association. The war broke out while the meeting was in progress and these gentlemen, as well as a number of other German men of science, were recently reported to be still in Australia. Dr. Penck, however, was reported, on Oct. 24, to have arrived in London.

POLAR

Antarctic

Antarctica and Some of Its Problems. The *Geographical Journal* (June, 1914, pp. 605-630) prints a most suggestive paper under this title by Prof. T. W. Edgeworth David, Professor of Geology, University of Sydney, from which the following data are taken:

The area of Antarctica has been estimated by Dr. W. S. Bruce at over 5,000,000 square miles. Its mean altitude, the greatest of any of the continents, has been roughly calculated at about 6,000 feet, including its ice cap. If this were removed the mean altitude would be reduced by perhaps 1,000 to 2,000 feet. The coast line, omitting minor indentations but including the seaward boundary of thick, fast ice, is not less than about 14,000 miles long. Only about 4,000 miles have been even approximately explored and only about 2,500 miles in moderate detail. Little is known of the actual boundary between land and sea-ice for about 11,500 miles. It is difficult to define this unknown boundary by oceanographical survey, unsupported by inland sledge parties, because old pack ice keeps ships so far from the true rock coast that it is often invisible from the ship. Mr. Wild, of Mawson's expedition, found that, in Queen Mary Land, the Watson Glacier projects over 120 miles into the sea. The Ross Barrier extends, at a maximum, about 400 miles seaward of the true rock coast at its apex.

Portions of the Antarctic coast that are moderately well known may be divided (1) into more or less high rock coasts, (2) coasts with occasional nunataks and (3) ice coasts. Of these three principal types of known coasts about 2,500 miles are rock coasts and about 1,000 miles are nunatak coasts. The third type of coast—land barrier ice where the ice forms a sea-cliff resting on a rock foundation, and shelf ice where the ice projects some distance from the shore seaward—is the most characteristic feature of the Antarctic coast. It is, of course, a false coast in relation to the true outline of the land and in some cases is hundreds of miles in advance of the true coast.

With regard to mountain ranges, Dr. W. S. Bruce has given an approximate forecast of the probable positions of the chief mountain ranges of Antarctica. Dr. Mawson adopts Bruce's view that the great rock-faulted ranges of South Victoria, with their absence of folding and Atlantic type of eruptive rocks, are coincident with the highland described by Charcot at Terre Loubet, Terre Fallières, Terre Charcot; by Arctowski near Bransfield Strait, Gerlache Channel, etc.; and by Nordenskiöld, Gunnar Andersson, etc., near Hope Bay, Snow Island, Seymour Island, etc. The last area has considerable development of Jurassic rocks, comprising variegated tuffs and richly fossiliferous plant horizons. The latter are associated with igneous rocks of a very marked Pacific

type and the authorities mentioned, and others, agree in regarding this western extremity of the Antarctic Continent as a direct continuation of the South American Andes; and they consider its whole structure as distinctly of Pacific type.

There are grave difficulties in the way of connecting the Antarctic horst of Ross Sea with the Andean fold ranges of Antarctica. Geographically this is the greatest of unsolved Antarctic problems. The great question is, are these two ranges one and the same or does the horst continue in the direction of Vahsel Bay at the head of Weddell Sea, where the horst may have become so low that it loses itself in relatively small nunataks. If the horst follows the latter direction, Penck's view of a strait from Weddell Sea to Ross Sea, cutting Antarctica in two, will prove to be correct.

The journey of Amundsen to the South Pole has confirmed Bruce's views in regard to mountains stretching from King Edward VII Land to the Antarctic horst.

Professor David also deals with the inland ice, notes that Amundsen crossed the ice divide, 11,000 feet above sea level, and calls attention to the importance of the further tracing of this ice divide and subordinate divides so as to define the chief ice drainage basins. The greatest thickness of the ice yet measured is that of the Drygalski ice barrier tongue, about 2,000 feet; but perhaps the inland ice is thickest where it is dammed back against the western side of the Ross region horst, and there it may be 5,000 feet thick. Probably, wherever there is a continuous downward slope seaward of the rock surface on which the ice rests, the thickness of the inland ice does not exceed 2,000 feet; but where tectonic sags and *senkungsfelder* exist, so as to impound the ice, its thickness may be much greater.

The author discusses the Nansen, Ross and Kaiser Wilhelm II Barriers and the geology of the continent. He referred to the probability that the growth of the Antarctic barriers is due to glacial tongues pushing out over the seas and joined together by snowfall, thus uniting the isolated tongues into a coherent whole. Many interesting oceanographic problems await solution, submarine ridges and banks will in time be traced, many soundings and temperatures are needed in the neighborhood of great barriers and glacier tongues and also deep as well as surface current observations. Professor David's remarks on meteorology are here quoted entire:

"In meteorology there is a grand field for research. Dr. Bruce has pioneered the way in West Antarctica, and as the result of his South Orkney observatory, and the later observations established by the enterprise of the Argentine Government, Dr. R. C. Mossman has lately shown that it is possible to predict the rainfall for sub-tropical Chile by knowing the barometric pressure in the South Orkneys. A high barometer there means that the Weddell Sea is iced over. A severe season with much sea-ice in the Antarctic appears, therefore, to be causally connected with a high barometric pressure, and this high pressure drives the low-pressure rainy belts further north than usual, and this gives sub-tropical Chile a good rainfall. Mossman has further shown that there is a remarkable coincidence between the height of the water of the Paraná River and that of the barometer in the South Orkneys. Mawson's wireless and meteorological station at Macquarie Island, which has daily been transmitting the weather elements to Australia and New Zealand, has proved of such value for understanding weather conditions that the Commonwealth Government have decided for the present to maintain the station at their own expense.

"It is hoped that, in time, a causal connection will be traced between the condition of the ice near Ross Sea and the position of the rainy belts over Australia and New Zealand. With a more detailed knowledge of the oceanography, glaciology, and meteorology of Antarctica, the whole cycle of weather conditions, not only in the Southern Hemisphere, but even north of the equator, will become much clearer. When one thinks of the financial losses, sufferings to man and beast, even disastrous shipwrecks that may be averted by reason of this fuller knowledge, one cannot but feel that, apart from the gain of noble traditions and high sentiment, Antarctic exploration, with all its hazards and all its tragedies, is more than justified by its solid additions to the sum of human knowledge."

ANTHROPOGEOGRAPHY

Wet Bulb Thermometer Readings and Tropical Colonization. Investigations have been made by Vincent, Lancaster, Tyler and others of the effects of different combinations of air temperature and relative humidity upon human comfort and health. The subject has also attracted the attention of psychologists, Professor E. B. Titchener, of Cornell University, having recently written upon "The Psychophysics of Climate." Professor J. W. Gregory also presents a paper on the wet-bulb thermometer and tropical colonization (*Journ. Scot. Met. Soc.,* Vol. XVI, No. 29). The view that the tropics are injurious to health is prevalent, but the explanations of the fact are generally unsatisfactory. While heat is regarded as one of the principal factors in tropical diseases, it is recognized that no locality with a dry climate has a temperature so high as to be injurious to health. The hottest districts are often the most healthful. The healthfulness of tropical localities does not depend upon diurnal or annual ranges of temperature, and moisture is not necessarily injurious. The latter is, indeed, beneficial for some constitutions, but heat and moisture combined may be harmful. Experiments appear to indicate that "the industrial development of any locality where the wet-bulb temperature exceeds 80° will be almost and, if it exceed 88°, quite impossible." But statistics supplied to the author of this paper by the London Meteorological Office show that such high wet-bulb temperatures do occur in well-populated localities. The author regrets that the distribution of such temperatures is not well known. During part of the time when Professor M. W. Harrington was Chief of the U. S. Weather Bureau, wet-bulb 8 A. M. readings were printed on the Washington daily weather maps. In his "Handbuch der Klimatologie," von Hann recommends the inclusion of these readings in regular climatological tables. The *Annual Summary of the Australian Monthly Weather Report* for 1910 contains monthly wet-bulb isotherms from 9 A. M. observations. R. DeC. Ward.

OBITUARY

Alfred John Jukes-Brown. This well-known geologist, formerly connected with the Geological Survey of England, died on August 14 at the age of sixty-three years.

Dr. H. J. Johnston-Lavis. Dr. Johnston-Lavis, Professor of Vulcanology in the Royal University of Naples, was killed in a motor accident at Bourges early in September. He was born in London in 1856. He first attracted wide attention by his studies of Vesuvius and the large, detailed map he made of the volcano and its more recent lava flows.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

Lake Michigan and the French Explorers. By E. P. Morton. (The Great Lakes Series.) 104 pp. Ills. Ainsworth & Co., Chicago, 1914. 7½ x 5½.

Tells well for young readers the story of the lake and the early history of its exploration and the settlements on its coasts.

Permo-Carboniferous Vertebrates from New Mexico. By E. C. Case, S. W. Williston and M. G. Mehl. 81 pp. Map, ills. Carnegie Inst., Washington, D. C., 1913. 12 x 9½.

The area in which these palæontological researches were prosecuted lies in north-central New Mexico in the modern valley of the Chama River. The student of the fossil remains of the life of this remote part of the Southwest will find much of interest in this volume. To geographers it will have quite another appeal. The present surface of our land masses is a resultant. Known and measurable forces have been acting for certain periods of geological time, of epochs and ages, upon a former land mass. The better we comprehend the extent of the former land mass the better will be our geography as the final chapter of a history measurable by the life of the world. The more we know of the remains of animal life of any geologic period the better are we able to reproduce the geography of the past out of which the geography of the present arrives by evolution under natural law.

The Indian War of 1864. Being a Fragment of the Early History of Kansas, Nebraska, Colorado, and Wyoming. By Eugene F. Ware. xi and 601 pp. Ills. Crane & Co., Topeka, Kan., 1911. $1.50. 8 x 5½.

Not a history so much as a book of personal reminiscences. The author, an officer in the United States army, spent several years in field duty in the Platte Valley. Besides keeping a journal he wrote many home letters which were afterwards found to be preserved and from these two sources the book has mainly been compiled. The first-hand impressions are interesting reading and will become valuable aid in writing the history of the development of these regions.

F. V. Emerson.

The Colonising Activities of the English Puritans. The Last Phase of the Elizabethan Struggle with Spain. By A. P. Newton. With an introduction by C. M. Andrews. x and 344 pp. Map, index. Yale University Press, New Haven, 1914. 9 x 6.

This volume is a careful study of the two thick folio volumes, containing the "Journal of the Governor and Company of the Adventurers for the Plantation of the Island of Providence" and the "Book of Entries" of the same, found in the English Public Record Office. The island of Providence, or Santa Catalina, about six by four miles in extent, lies off the coast of Nicaragua, in about 13°20′ N. and 81°20′ W. The association was a joint stock company chartered by Charles I. The "Adventurers" or stockholders were the foremost Puritan leaders of the nobility and gentry, who opposed Charles I. The "Journal" and "Entries" cover a period of eleven years, during which Charles ruled without Parliament. The records throw considerable light on the inside history of the Massachusetts Bay Colony and the Saybrook Project. The motives of the speculators were a curious mixture of Puritan zeal, commercial activity, and desire to break the world power of Spain. All of these aims came

to grief. The Puritan colony became a refuge for buccaneers; the company suffered financial loss, the Spanish world power remained unbroken. The trend of historical opinion will doubtless agree with the writer's view, that the Puritan temper inclined to a pronounced meddling of ecclesiastics in civil government, but will probably include this in the larger induction that such meddling in state affairs is inherent in every ascendant and dominant religious society. It is curious that Robert Rich not only obtained its charter for what was afterwards the abolition state of Massachusetts, but also brought about the first selling of negro slaves in Virginia. DAVID H. BUEL.

Logging. The Principles and General Methods of Operation in the United States. By Ralph Clement Bryant. xviii and 590 pp. Ills., index. John Wiley & Sons, New York, 1913. $4.50. 9½ x 6.

Students in forestry schools will find this text to be the most complete of its kind yet published. The book will be helpful also to persons interested in the utilization of the forest, and as a reference work for technical high schools and academies.

The text includes brief discussions of forest resources of the United States, forest protection, labor, camps, and tools. It very naturally emphasizes the processes employed in logging in the different forest regions of the United States. Transportation by means of animals, railroads and water is covered with considerable detail. There are two short chapters on turpentine orcharding and harvesting tan-bark. The appendix includes a well-selected bibliography, definitions of terms used in logging, and several log grading rules.

The book is well written and fully illustrated. It is opportune, for there is now a definite demand for texts which tell the story of processes in production. Professor Bryant has done for forest production what should be accomplished in other lines, as, for example, in the different fields of agriculture.

G. E. CONDRA.

The American Japanese Problem. A Study of the Racial Relations of the East and the West. By Sidney L. Gulick. 349 pp. Ills., index. Charles Scribner's Sons, New York, 1914. $1.75. 8 x 5½.

A broad-minded treatment of the ethnological, sociological and political questions arising from the contact of the United States with Japan. Based upon personal experience and investigation, it lays bare the mutual illusions of the White Man and the Yellow Man with regard to each other. The Yellow Peril and the White Peril are subjected to a searching analysis and shown to be equally baseless. It is claimed that experience shows that the Japanese in this country are thoroughly assimilated to our civilization, and that biological considerations tend to show that amalgamation through intermarriage is entirely practicable. But it is not advocated, it is strongly discouraged. The Hobson theory of the feasibility of a Japanese military occupation of this country is considered impossible. A foreign policy for this country is urged which shall show no discrimination against any nation of the Orient and yet practically provide against an industrial invasion of this country from the Far East. The prominent feature of such a policy is an immigration law restricting the immigration from any country to a percentage per annum of the people of that country (including their children who are already naturalized citizens of this country). An urgent plea is made for a policy of sympathy for all nations, of redress of past injustice done them, and of practical help for those who most need it. DAVID H. BUEL.

Mountaineering and Exploration in the Selkirks. A Record of Pioneer Work among the Canadian Alps, 1908-1912. By Howard Palmer. xxvii and 439 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1914. $5. 9½ x 6½.

A book remarkable for its combination of mountaineering, enthusiasm and scientific spirit.

Before Mr. Palmer's series of remarkable excursions into the Mt. Purity District south of Glacier House, "the red letter day in the annals of Selkirk mountaineering," as he so aptly puts it, was in 1890. The eighteen intervening

years are an eloquent witness of the difficulties of the region: a luxuriant vegetation in the lower valleys, lack of trails and low passes, inability to use animals for transport and lack of human porterage,—all of which turned the tide of sport and exploration to the higher peaks and open, lake-studded valleys of the Canadian Rockies with their Indian trails and possible animal transport. A reader acquainted with the Selkirks marvels at Mr. Palmer's accomplishments upon a commissariat limited to the backs of himself and his companions.

The first portion of the book deals with the region of Rogers Pass and south of it for twenty miles. It is a "continuous performance" over ice and rock with vegetation only in the depths of the Geikie and Battle Creek valleys. In this district Mr. Palmer not only accomplished everything that his predecessors did, both in mountain climbing and geographical exploration, but he penetrated to the hitherto unvisited foot of the Battle Creek Range and the summit of Grand Mountain, leaving no high virgin peak behind.

The second portion of the book, comprising about two-thirds of the whole, deals with the exploration and mapping of the hitherto practically unknown districts north of Rogers Pass within the Great Bend of the Columbia River. Here Mt. Sir Sanford, the highest peak in the Selkirks (11,596 feet), is the point of attack, and the immediate region surrounding it is most thoroughly described. The six attempts to reach its summit rival in exciting interest Whymper's similar attempts on the Matterhorn, fortunately with equal success and without his tragedy.

Geographically Mr. Palmer has here shown to the world an absolutely unknown region and, the physical difficulties of the situation considered, has placed himself among the explorers of first rank, while the numerous appendices, among them his topographical surveys, observations of glacial movements, and meteorological records, show how much excellent work can be done by a careful and conscientious unprofessional observer and recorder.

The work is so profusely illustrated that it is possible for an interested reader—even one unacquainted with the region—by a constant comparison of text, map and illustrations to follow the expedition visually. As a guide book to the Selkirk region it cannot be surpassed. As a complete history of exploration in that region it leaves nothing to be desired. C. S. Thompson.

Recollections of Sixty Years. By the Rt. Hon. Sir Charles Tupper. vii and 414 pp. Ills., index. Cassell & Co., London. Funk & Wagnalls Co., New York. 16s. 8½ x 6½.

It is unusual that a man in his 92nd year should be able to write his recollections of a long public life. A medical man, Sir Charles Tupper, after twelve years of professional practice, graduated into the larger sphere of public life. These "Recollections" begin with his address at the Mechanic's Institute of St. John, N. B., "On the Political Condition of North America," in 1860, and close with a selection of letters of congratulation written to him on his taking up the premiership of Canada in 1896. This story of his public life is inseparably bound up with the political, industrial, and educational development of Canada during this period. It records the struggle for religious equality before the law, for the confederation of the Maritime Provinces, of the whole of Canada, of the entire British Empire. His memories of the rising of Louis Riel, of the founding and upbuilding of the Canadian Pacific Railroad, and of the Fisheries Question between this country and Canada are worthy of note. Throughout is discernible the breadth of view of a public man of the widest experience. The work abounds in letters of men of note concerning public affairs affecting Canada and this country, and so will be valuable to the historian of this period. David H. Buel.

SOUTH AMERICA

Geschichte Südamerikas. Von Hermann Lufft. Sammlung Göschen. I: Das spanische Südamerika (Chile, Argentinien und die kleineren Staaten). 136 pp. Index. II: Das portugiesische Südamerika (Brasilien). 140 pp. Index. G. J. Göschen, Berlin & Leipzig, 1913. 90 pfg. each. 6½ x 4½.

A very brilliant picture of South America past and present. There is a

rough outline of the physical environment—the aim is not very high here—an admirable account of European and Spanish conditions at the time of the Conquest, an attempt at the inner meaning of the Renaissance for the Spaniards and the state of mind of Conquistadores and conquered alike. The little pen pictures of Bolivar, San Martin and Rosas are gems. The whole of the second volume is devoted to Brazil, and its economic present and future is gone into in detail. The promise of Brazil's future and the author's interest in the German colonies of the southern states seem to explain the rather disproportionate treatment of this country. The variety and contrast of Brazil's races are put in sharp relief. The country is advised to cultivate the integrity of each race. The Germans are urged, without resisting in any way the official use of Portuguese, to preserve German speech and culture, to be patriotic Brazilians and to take part in public affairs. The Argentine is less fully treated. Wheat culture is still ''Raubkultur'' and still occupies but a fifth of the available space. Chile has little land for colonizing. MARK JEFFERSON.

Illustrated South America. A Chicago Publisher's Travels and Investigations in the Republics of South America, with 500 Photographs of People and Scenes from the Isthmus of Panama to the Straits of Magellan. By W. D. Boyce. 638 pp. Maps. Rand, McNally & Co., Chicago & New York, 1912. $2.50. 9 x 6.

Admirably illustrated. About the best 500 South American photographs that the reviewer knows of in one book, including many interior regions of which pictures are scarce. Mr. Boyce figures at times in the pictures. He is not shy, but a newspaper man, who writes easily and tells very plainly what was told him. Some of the presidents of republics told him things, for he tells us of all the notables that he got in touch with. He traveled in generous style. Although he does not realize that books exist that tell a good deal of what was new to him, he has put a great deal of interesting new matter in his book. His idea of investigation is that of a hustling newspaper man to get some report *now*. He visited all South America in one year. He had no training in languages nor in real study. One is not surprised that he finds that the Andes send the water from their snows to the Pacific by underground rivers, which will be some day tapped in the desert coast regions of Peru by wells! Also that 13/16ths of Lake Superior's waters are similarly derived from underground rivers! The book has much useful material for the geographer.

MARK JEFFERSON.

AFRICA

Egypt in Transition. By Sidney Low. With an introduction by the Earl of Cromer. xxiv and 316 pp. Index. The Macmillan Co., New York, 1914. $2.50. 8½ x 6½.

The Earl of Cromer, who, for a quarter of a century, was the virtual ruler of Egypt, in his introduction to this book says that the author ''has produced a lively and, as far as I can judge, a very trustworthy account of the present condition of affairs in the valley of the Nile. I have no hesitation in commending what he has written to the favorable consideration of all who are interested in the subject.'' The book contains a good account of life and conditions in the Nile delta, a part of Egypt that receives scant attention in most books on that country.

My Somali Book. A Record of Two Shooting Trips. By Capt. A. H. E. Mosse. xxv and 314 pp. Ills., index. Sampson Low, Marston & Co., Ltd., London, 1913. 12s. 6d. 9½ x 6.

A good hunting book by one who began his experience as a lion hunter by killing five lions in two days. He gives much information, very valuable from the sportsman's point of view, as to the capabilities of various types of modern weapons, the kinds of game in Somaliland, their habits and characteristics, how to track and kill them, protective coloration, and the outfit and cost of hunting expeditions. The work will interest the brotherhood of big game hunters. Its

author has had large experience in Asia and excellent success in a bit of Africa. British Somaliland is a good game country but is likely to be closed to hunters for some years to come. The British Government has now withdrawn all its posts in the interior. As it occupies only the coast, the happy hunting grounds are not regarded as safe just now with the Mad Mullah and other impediments still in the way.

Planting in Uganda. Coffee, Para Rubber, Cocoa. By E. Brown and H. H. Hunter. With contributions by Prof. Dunstan and G. Massee. xvi and 176 pp. Ills., index. Educational Co. of Ireland, Dublin, 1913. 9 x 6.

Uganda is one of the most promising African colonies of Great Britain. The possibilities of agricultural development foretold by Sir Harry Johnston are being realized. Plantation industries are favored by good soils and altitudes of 3,000 feet or more. Uganda cotton has already taken its place among the standard cottons of British commerce and the exports amount to over $1,000,000 a year. Para rubber in some districts has been an unqualified success. Coffee has also been regarded as having bright prospects, but a fungoid disease that has just appeared may impair its future. Uganda bids fair to become one of the chief cocoa-producing countries. Such facts add importance to this careful work, the result of ten years' experience, devoted to every practical question relating to the choice of land for plantations, plantation development, transportation facilities, etc.

Through the Heart of Africa. Being an account of a journey on bicycles and on foot from Northern Rhodesia, past the Great Lakes to Egypt, undertaken when proceeding home on leave in 1910. By F. H. Melland and E. H. Cholmeley. xvii and 305 pp. Map, ills. Constable & Co., London, 1912. 12s. 6d. 9 x 6½.

The authors are young Englishmen of education and good position in the administrative service of Northern Rhodesia. Their experience in this newly developing region of Central South Africa qualified them to observe accurately and write in an edifying manner of what they saw in German East Africa, British East Africa, Uganda, and the upper Nile, as they made the long inland journey to the Mediterranean. They report tropical Africa as developing with wonderful rapidity and have great confidence in the future of the continent. Their book is to be commended as very readable and unusually informing.

ASIA

Overland to India. By Sven Hedin. Vol. I, xix and 416 pp. Maps, ills. Vol. II, xiv and 357 pp. Index. Maps, ills. Macmillan & Co., Ltd. London. 1910. $7.50. 2 vols. 9 x 6 each.

Zu Land Nach Indien durch Persien, Seïstan, Belutchistan. Von Sven Hedin. Vol. I, xi and 407 pp. Map, ills. Vol. II, viii and 394 pp. Map, ills., index. F. A. Brockhaus, Leipzig. 1910. 9 x 6 each.

There is a certain quality about the style of this record of days far afield which makes easy reading. These two volumes are but the expansion of day by day entries in diaries. Yet the author's art has sufficed to conceal the dull diary routine, the calendar has been skillfully disguised, and we are led rapidly through the routine of desert days from camp to camp with no loss of the vivid quality of reconnaissance record. All the distances are reckoned in farsakhs, the once familiar parasang of the Anabasis record. The country is much the same, for in the earlier stages, Dr. Sven Hedin certainly crossed the line of Xenophon's retreat from the field of Arbela.

Nor is the Athenian mercenary the only predecessor in this dry waste. Alexander twice forced his army through these deserts. Marco Polo found in these hardships his way to China. Hedin in this traverse has studied carefully the courses of these predecessors and has much entertaining discussion of their several routes. With him the trip was but the preface to the exploration of

Tibet by way of Kashmir. He chose this way of reaching India in order that he might give particular attention to the desert physics in so far as they may shed light on the problem of desiccation which has so greatly engaged the attention of the geographers of inner Asia.

After a false start at Batum he began his journey at Trebizond. From that ancient stronghold as far as Teheran he was restricted to well-known highways. Thenceforth he was able to pick routes where no European had gone before; thus, to his particular research he was able to add a new route which will tend to open up more of the wastes of Persia and Baluchistan to the record of our maps. His route led him by way of the great Kevir through Kuhistan and Seistan and through the land of the Baluchi to the Indian rail head at Nushki.

Soon after leaving Teheran he entered the great Kevir (salt waste) and followed its southern and western edge for many marches. Twice he crossed the Kevir solely in zeal of exploration, for the traverse was uncomfortable and might at any moment have become perilous if the rain, which was not withheld, had lasted for the brief space which would have turned its mud flats and salt flats into quaking bog. No such extensive study has ever been made of this formation so characteristic of eastern Persia and so important in the study of desiccation phenomena. The tracing of contours of equal altitude shows that these present salt bogs occupy the sites of lake beds. The same is observed to be true of the similar beds of playa in the plateau of Nevada, disjoined fragments of the Bonneville formation. Beyond this initial fact there is great uncertainty. Hedin shows that much of the kevir appearance is best explained on the theory that it is a mass yet plastic. In an epoch of higher precipitation (and he cannot find that such was the case much later than the ice age) these kevirs were lakes, commonly without exit or soon sinking below the level at which outflow is possible, therefore becoming eventually salt lakes. They have been acted upon by steady evaporation tending to reduce their water level from above and by æolian portage of dust equally tending to reduce the water space from below by the sinking of the particles. On the other hand, they have had accretion from torrents in time of rain and these torrents have brought down great freight of denudation material from the bare ravines through which they course. These changes are so slow as to be secular. There is no evidence that, in any historical period, have the kevirs been other than they now are.
WILLIAM CHURCHILL.

Gaza: A City of Many Battles (From the family of Noah to the present day). By T. E. Dowling. 120 pp. Ills., index. Soc. for Promoting Christian Knowledge, London, 1913. 2s. 7½ x 5.

An outline history of this famous place in Palestine to which many references are made in the Old Testament, though the New Testament has only one reference to it. The literary sources down to the present time are also quoted; and more extended description of the town of to-day is given in the concluding forty pages.

America and the Philippines. By Carl Crow. xi and 287 pp. Ills. Doubleday, Page & Co., New York, 1914. $2. 8½ x 5½.

A competent and informing book on these islands, our relations to them, what we have been trying to do for the people and what we have really accomplished. In the author's opinion, if America should withdraw from the islands, ten years would wipe out all trace of her occupancy other than the buildings erected.

The Philippine Problem, 1898-1913. By Frederick Chamberlain. 240 pp. Ills. Little, Brown & Co., Boston, 1913. $1.50. 7½ x 5.

The author is thoroughly in sympathy with the former Philippine policy of our government, which, in 1898-1913, wrought so many changes among the islands and so vastly improved conditions in respect of government, health, education, public improvements, etc. It is one of the best small books that have been

written on the Philippines and all who read it will know what our government has tried to accomplish, what has really been attained, and what appears to the author to be the present needs of the situation.

AUSTRALASIA AND POLYNESIA

The Climate and Weather of Australia. By H. A. Hunt, G. Taylor and E. T. Quayle. 93 pp. Maps, index. Commonwealth Bur. of Meteorol., Melbourne, 1913. 9½ x 6½.

Australia is climatically one of the most interesting land areas of the world, on account of its compactness, its position in relation to the different wind belts, the contrasts between its interior and coasts, and the excellence of the meteorological work which is being done there. This new volume, the first "in the nature of a text-book which has been published on Australian Meteorology," is one of the most satisfactory discussions on climate and weather which we have seen for any region. It is not only remarkably complete, but it is interesting. A great deal of emphasis is rightly laid upon the weather element, and that, when adequately carried out, ensures the success of a climatological discussion. Not only are the mean climate conditions carefully charted and explained, but the characteristic weather conditions which make up the climate are clearly and fully presented. One-third of the figures are devoted to weather types—none too large a proportion if a valid and accurate picture of the climate is to be given.

We note with satisfaction the admirably clear, colored maps showing the regions of maximum monthly rainfall; the relation of contour to rainfall; the climatological regions with type stations—an excellent idea which might well be followed in all discussions of the climates of any considerable area,—and the weather type maps just referred to.

Would that we had many similarly clear-cut, systematic, complete and interesting discussions of the climates of other regions. If we had, climatology would receive more attention on the part of many who now, we fear, turn away discouraged from the massive and "dry" volumes of carefully tabulated and summarized climatic data which, somehow or other, fail to give the seeker for a vivid climatic picture what he really wants. R. DEC. WARD.

The Coming Hawaii. By J. K. Goodrich. The World To-Day Series. x and 329 pp. Ills., index. A. C. McClurg & Co., Chicago, 1914. $1.50. 7½ x 5.

Professor Goodrich's book is wholly commendable as containing so much of the story of the past and present of Hawaii as to give its readers all that is really necessary for intelligent apprehension of the archipelago, its history, people, resources, progress and prospects. Its concluding chapter, only eight pages of text, gives the book its title, but the preceding chapters lead naturally to the deductions as to the prospects ahead. The author says that very much of what the coming Hawaii is to be depends upon success in agricultural development, that agriculture is capable of large expansion and that the population should be increased by immigrants of the farming and stock-raising classes from the United States. No pecuniary aid is given to intending immigrants, but the government is encouraging them in all other ways, and two communities of white settlers, partly from the United States, have already been formed. There are several hundred thousand acres of good land now open to settlement. The author regards the future of the territory as bright with promise. A bibliography of 124 titles is included.

Die Deutschen Marianen, Ihre Natur und Geschichte. Von S. von Prowazek. iv and 125 pp. Ills. J. A. Barth, Leipzig, 1913. Mk. 4. 9 x 6.

Within the most modest pamphlet semblance this little volume affords a most valuable supplement to Safford's two works upon our American possession in the Mariannes, the island of Guam. Although the fifteen islands of

the archipelago lie in close succession they fall into four groups: Urakas, Maug, Assongsong, and a channel; Agrigan, Pagan, Alamagan, Guguan, Sarigan, Anatahan, and a channel; Saipan, Tinian, and a channel; Rota and Guam or Guahan. The three channels are not great waterways, yet they have served to establish distinct zoogeographic and phytogeographic provinces which render such a book as Safford's "Useful Plants of Guam" not quite applicable, sometimes containing too much for the northern groups, at others falling short. This little monograph corrects Safford in each particular and should serve as a supplement to his work. A chapter on the form of the land masses of these islands, the formative elements at present active upon them, particularly the discussion of the Marianne extrusion in relation to the continental mass of Asia will prove peculiarly attractive to physical geographers, and all the more since the geognostic problems of the mid-Pacific are yet far from satisfactory settlement.

EUROPE

Days in Attica. By Mrs. R. C. Bosanquet. xiv and 348 pp. Plans, ills., index. The Macmillan Co., New York, 1914. $2. 9 x 6.

The book will be interesting to the student fond of his Greek classics and the legends and myths which they enshrine. He will find his Homer, his Æschylus, his Aristophanes, his Thucydides, his Herodotus and his Plutarch quoted in good English where they treat myth, or mystic rite, or temple, or landscape. In the running account of Attic history, ancient, mediæval and modern, a woman's eye is discernible, with keen observance of detail, and a nice discrimination of the peculiarities of woman's costume, as found on statuette, or vase or urn. There are appreciative descriptions of the different museums of Athens, and their classical antiquities, of the architectural remains of the ancient city, and those of the subsequent Roman occupation, as well as of the Byzantine churches, and the Crusaders' and the Turkish structures. The chapter on the home life of Attica gives an entertaining account of family life in town and country, the relations of husband and wife in the Greek household, their marriage customs, and their manner of caring for their children. The description of a European housekeeper's experience with Greek servants, cooks, butlers, gardeners, housemaids, and horsemen is amusing. The Greek returned from the United States is met here and there and duly appreciated. The book closes with an account of trips to the environs of Athens and a day's tour to Corinth and Chalcis. DAVID H. BUEL.

Camping in Crete. With notes upon the animal and plant life of the island. By Aubyn Trevor-Battye. Including a description of certain caves and their ancient deposits. By D. M. A. Bate. xxi and 308 pp. Map, ills., index. Witherby & Co., London, 1913. 10s. 6d. 9 x 6.

A series of tours about the island of Crete with the camp as a convenience in lieu of hotels. This island is well covered in the itinerary and a picture of the physiography and the people becomes thereby a fairly complete one. Canea, Candia and Sitia situated along the north shore, Mount Ida and the Nidha Plain in the interior and a few contacts with the southern shores are the landmarks of the route. The main part of the book is pleasant reading and will yield an intimate acquaintance with many details of Cretan physical geography, people and customs. The notes at the end of the book contain the more scientific account and here may be found very good accounts of the caves of the island, the flora, fauna, physical features, industries and people. Pictures and a good map aid the author in his story. ROBERT M. BROWN.

Wandlungen der deutschen Volkswirtschaft im neunzehnten Jahrhundert. Von W. Wygodzinski. 201 pp. M. Du Mont-Schauberg, Köln, 1912. Mk. 1.80. 8 x 6.

The book contains a course of lectures given by the author at the University of Bonn but intended for a wider circle of readers. Its object is to

show the inner connection between the economic changes which Germany has undergone during the last century, and which cannot be fully understood or appreciated unless studied as a part of the whole life of the nation. From this point of view the author discusses the changes from the old ideals to the new, the making of a living about 1800, the free and unrestricted competition of all about 1900. The effects of this change are seen in the development of capitalism, of technique, of traffic; the rise of the great industries and its baneful effect on the old free trades; the development of new commercial and financial methods; the growth of the large cities, and the fundamental changes in the working conditions of the country population, etc. While presenting an enormous subject, as it were, in nutshell, the book is nowhere shallow or superficial, and will be much appreciated by all who are looking for a brief introduction into the economic conditions of modern Germany.

M. K. Genthe.

WORLD AND PARTS OF IT

Das Mittelmeergebiet: Seine Geographische und Kulturelle Eigenart. Von A. Philippson. 3. Auflage. 256 pp. Maps, ills., index. B. G. Teubner, Leipzig, 1914.

The first edition was reviewed in the *Bulletin* (Vol. 36, 1904, p. 779). This edition is brought up to date as to geology, climatology, statistics, maps, etc.

Das Russische Reich in Europa und Asien. Ein Handbuch über seine wirtschaftlichen Verhältnisse. Herausgegeben von Dr. A. von Boustedt und Davis Trietsch. 2. ergänzte Auflage. 508 pp. Verlag für Börsen & Finanzliteratur, Berlin, 1913. Mk. 8. 9 x 8.

The volume is an example of German alertness to commercial opportunities. It contains statistics and other information in variety on the needs and conditions of Russian trade. In considerable part its material has geographical value. Numerous topical articles take up the production of raw materials and the movement of trade, with abundant mention of definite districts and localities. Sixty-four pages are devoted to the resources of Asiatic Russia and their development. A gazetteer furnishes terse information about the cities of commercial importance. This book makes available a good deal of not easily accessible information of an economic character, and so forms a valuable supplement to previous handbooks of the Russian Empire. Carl O. Sauer.

MATHEMATICAL GEOGRAPHY AND CARTOGRAPHY

Les cartes géographiques et leurs projections usuelles. Par L. Defossez. 116 pp. Ills. Gauthier-Villars, Paris, 1910. Fr. 2.75. 7½ x 5.

In this little book, one of the "Actualités Scientifiques" series, the author has selected the most usual methods of map projection and has given a simple explanation of each method. The higher mathematics are studiously avoided, but it has not been possible to avoid some rather formidable looking trigonometric equations.

The book contains an introduction and four chapters. In the introduction, various terms to be employed are defined, and mathematical relations are established. Numerical examples of the solutions of the equations of the great circle and of the loxodrome are given. Chapters I, II and III are devoted to explanations of the various forms of azimuthal, conic, and cylindrical projections, respectively. In each chapter, the theory of the projection is first given, then examples of its various modifications, and finally a comparison of these various forms. Chapter IV is devoted to several projections which are employed when the entire sphere is to be shown. James Gordon Steese,

Captain, Corps of Engineers, U. S. A.

Theorie der Erdgestalt nach Gesetzen der Hydrostatik von Clairaut. Herausgegeben von P. E. B. Jourdain und A. von Oettingen. Ostwald's Klassiker, Nr. 189. 162 pp. Diagrams. W. Engelmann, Leipzig, 1913. Mk. 4.60. 7½ x 5.

A. C. Clairaut (Clairault) was born at Paris in 1713, the son of a teacher of mathematics. At the age of thirteen he read before the Academy of Paris a paper on four newly discovered curves, and at sixteen completed "Researches on Curves with Double Curvature." After taking part in the expedition to Lapland for the measurement of the meridian he published in 1743 his "Theory of the Shape of the Earth according to the laws of Hydrostatics," which was the most important step forward in the study of the shape of the earth since the work of Newton, Huyghens, and Bouguer. Laplace called it "one of the most beautiful mathematical productions," and Todhunter has said of it: "In the figure of the earth no other person has accomplished so much as Clairaut; and the subject remains at present substantially as he left it, though the form is different. The splendid analysis which Laplace supplied adorned, but did not really alter, the theory which started from the creative hands of Clairaut." The work has therefore been rightly included in Ostwald's editions of "classical works of the exact sciences." The volume contains a translation of the original treatise, a short biography of the author, his portrait, and an appendix of notes and works of reference. M. K. Genthe.

PHYSICAL GEOGRAPHY

Coast Erosion and Protection. By Ernest R. Matthews. xiv and 147 pp. Maps, ills., index. Charles Griffin & Co., London, 1913. $3.50. 9½ x 6½.

Although this volume is designed primarily for use by engineers having to deal with harbor and coast protection, it contains some things of value to those interested in the physical geography of the shoreline. Among the abundant illustrations are some of the most remarkable pictures of breaking waves which have ever come to the reviewer's notice. The various types of sea defenses are well shown by good diagrams and photographs. A brief and rather superficial discussion of "wave-action," accompanied by diagrams incorrectly representing the water as moving forward in the wave troughs, is followed by two chapters summarizing the extent of erosion and accretion at different points on the English coast. It appears that a retreat of the shoreline under wave attack amounting to an average of fifteen feet or more per year is not uncommon, while other points advance into the sea almost as rapidly. The author properly concludes that the loss of land exceeds the gain, since part of the wave-eroded material must be carried out into deep water; but if he means that the *area* lost exceeds the area gained, his conclusion is not justified by his arguments; for the area might increase while the bulk of land decreased. Attention is called to the rather inconsistent attitude of the British Government, which, according to the author, contributes nothing to the cost of coast protection, but promptly seizes any new land formed from the eroded materials.

D. W. Johnson.

Mountains: Their Origin, Growth and Decay. By J. Geikie. xix and 311 pp. Ills., index. D. Van Nostrand Co., New York, 1914. $4. 9 x 6.

In a medium-sized volume, the veteran author has achieved a critical summary of the present status of orogenic knowledge. He has expressed its aim as to be "helpful to readers not especially versed in Geology, who desire a fuller knowledge than is usually presented in geographical textbooks."

The description of the simple mountains of accumulation is followed by a treatment of the more complex structures of deformation. Here the Alps serve as the principal, because the best studied, type. An excellent résumé is given of their geological structure and of the various theories that have been held with regard to their origin, culminating in the idea of overthrusts and of overfolds as their leading causes. The closing chapters are concerned with oceanic

margins as zones of instability, and with the carving of subsequent mountains from plateaus of accumulation and of erosion.

From a strictly geographical view-point, the book carries a good deal of geological ballast. This, however, the author explains by the statement of his own conception of the topic as a "borderland between Geology and Geography." In the choice of types a high degree of impartiality is shown between the Old and the New Worlds. In the clearness of its plan, in the careful analysis of many opinions, and in the adequacy of its language this latest volume is a worthy addition to the works of James Geikie. Mention should also be made of the splendidly selected illustrations, reproduced by half-tones of remarkable brilliancy. CARL O. SAUER.

Engineering Geology. By Heinrich Ries and Thomas L. Watson. xxvi and 672 pp. Ills., index. J. Wiley & Sons, New York, 1914. $4. 9½ x 6.

A thorough, practical, geological training should be included in the education of a civil engineer, and to meet that need, this book was written. Due to the fact that the non-metallic minerals play a major part in the problems encountered by a civil engineer, the authors have dealt primarily with the non-metals, only one chapter being devoted to ore deposits. Among the subjects considered are: rock-forming minerals; rocks, their origin, composition and use as building stone and road material; structural geological features, and their relation to tunneling operations, dam and reservoir foundations, landslides; rock-weathering and soils, with the effect of soils on sewage disposal; surface river waters, and erosion; geological factors effecting and controlling underground water supplies; a detail study of landslides; wave action and shore currents, their relation to coasts and harbors; lakes; glacial deposits; building stone, cement, clays; coal; petroleum, natural gas; road materials; ore deposits. The various geological principles set forth are made clear by citing actual cases, which show the application of the principles. Added to the written explanations are photographs, maps, diagrams and sections with which the book is illustrated profusely. The book is both interesting and of practical value. It should prove of worth not only to students of engineering, but also to experienced engineers. WILBUR GREELEY BURROUGHS.

Lehrbuch der Geologie. Von Emanuel Kayser. 2. Teil: Geologische Formationskunde. 5th edit. 852 pp. Ills., index. F. Enke, Stuttgart, 1913. Mk. 22. 10 x 6½.

The fourth edition of Dr. Kayser's admirable Lehrbuch was reviewed in the *Bulletin* (Vol. 45, 1913, p. 64). In the fifth edition Vol. 2 has been enlarged from 798 to 852 pages. Since the first edition was issued the author's intention to keep his book up to date has been noteworthy in every reissue of the work. One of the distinctive features of the Lehrbuch is the number of illustrations, which has again been enlarged in the present edition.

OCEANOGRAPHY

The Ocean. A General Account of the Science of the Sea. By Sir John Murray. Home Univ. Library. 256 pp. Maps, index. Henry Holt & Co., New York. 50 cents.

The late Sir John Murray's authority in oceanography is so great that a reviewer comes near presumption who tells readers that this is an admirable primer. No copyright notice and no date, but the work was written since the *Titanic* disaster, for we are told that she doubtless lies on the bottom intact, except for the implosion of bottles and other enclosed spaces. It is popularly written and interesting. Many new results are given and so well stated that no geographer can well afford to be without the book. Special interest attaches to the geosphere chapter, and its brief statement of Murray's "tektosphere." Oceanography does not tolerate continental bridges like Gondwanaland. Rarely, a modern note appears rather to tantalize than help; as *path heat*, *spin heat*, and *wobble heat*, p. 65, "Murray and Irvine's well-known experiments," p. 220! Surely not to general readers.

The maps are crude, behind the times. One would say they had not Sir John Murray's supervision. That of ocean depths is inexpressive and inaccurate. The temperature and density charts are highly and unnecessarily generalized, which is a pity in a book of such rare value. Its small scale is no reason for putting the equatorial Romanche Deep a degree too far west, nor the Porto Rico Deep 200 miles too far north. The West African Basin is not brought out even so far as an accurate drawing of the 2000 fathom line would allow, with a better expression of the Walfish Ridge of Supan, which is here hardly hinted at. The text, too, has no word of the contrast of bottom temperature in the East and West Atlantic Basins that result from this ridge.

MARK JEFFERSON.

Der Ozean. Eine Einführung in die allgemeine Meereskunde. Von O. Krümmel. 2nd ed. viii and 285 pp. Maps, ills., index. G. Freytag, Leipzig, 1902. 7½ x 5½.

"Der Ozean" is the great oceanographer's contribution to the series of concise compendiums entitled "Das Wissen der Gegenwart." It is compact in plan and includes as its major topics the distribution and articulation of the oceans, the nature of the sea-floor, the composition and temperatures of the sea-water, and the forms of water in motion. In the earlier chapters much space is devoted to the methods employed by the oceanographer in his research. The final chapter is a masterly treatment of waves, tides, and currents. The little volume is packed full of examples drawn from a great range of sources. Krümmel seems to be able to quote any reference from the Odyssey down to date. It is to be regretted that the publishers have economized on the cuts, which are decidedly ill assorted. CARL O. SAUER.

METEOROLOGY AND CLIMATOLOGY

The Atmosphere. By A. J. Berry. Cambridge Manuals of Science and Literature. 146 pp. Ills., index. University Press, Cambridge; G. P. Putnam's Sons, New York, 1913. 40 cents. 6½ x 5.

The title of this book is somewhat misleading. "The Gases of the Atmosphere" would seem to be better. Beginning with a brief history of the first experiments, the author traces the rise and fall of the principal theories concerning the atmosphere. This is followed by a short discussion of the principal constituents on the basis of our modern knowledge. The last half of the book is devoted to the following topics:

The escape of gases from planetary atmospheres according to the kinetic theory: liquid air; the inert gases in the atmosphere; the radioactivity of the atmosphere; the probable composition of the atmosphere in early geological time.

At times explanations are very simple and lucid and at times they lose themselves in chemical formulæ or mathematical physics. In general the treatise is interesting. Perhaps its chief value lies in the descriptions of the principal experiments that have been employed for years past to determine the nature of the atmosphere and its composition. EUGENE VAN CLEEF.

The Place of Climatology in Medicine. Being the Samuel Hyde Memorial Lectures read before the Section of Balneology and Climatology of the Royal Society of Medicine, May 20 and 21, 1913. By William Gordon. 62 pp. H. K. Lewis, London, 1913. 9 x 5½.

The Influence of Strong, Prevalent, Rain-Bearing Winds on the Prevalence of Phthisis. By William Gordon. 108 pp. Maps, index. H. K. Lewis, London, 1910. 9 x 6.

Dr. Gordon makes a strong plea for the recognition of climatology in the medical curriculum in his "Samuel Hyde Memorial Lectures," which were delivered before the Section of Balneology and Climatology of the Royal Society of Medicine in May, 1913. He points out the seriousness of the present neglect

of this branch of teaching, and emphasizes the importance of what he calls "a new principle in climatological investigation, *viz.*, the principle of approximate isolation of influences." The recognition of the importance of this "new principle" as a working basis is certainly not new, but its application in climatological research has not, as Dr. Gordon observes, been given adequate attention. A further point upon which our author lays emphasis is his view that there is no valid evidence that altitude *per se* affects the prevalence of phthisis.

Dr. Gordon's own opinion in regard to phthisis is that the prevalence of that disease is influenced by strong prevalent rain-bearing winds. This thesis he has set forth, with great care, in his second volume (published in 1910), in which he presents the evidence collected during ten years. It must suffice here to say that he has brought together a large amount of statistical evidence in support of his view which, if accepted to any degree, will mean, as he says, that "much of the climatology of phthisis will have to be reconstructed."

R. DeC. Ward.

Our Own Weather. A Simple Account of Its Curious Forms, Its Wide Travels and Its Notable Effects. By Edwin C. Martin. 281 pp. Ills., index. Harper & Brothers, New York & London, 1913. $1.25. 7½ x 5.

"The weather itself is but an activity. The air of the atmosphere, like the water of the sea, and, indeed, like all nature, including man, is forever seeking ease and never quite finding it. The weather is simply the air's business." Thus does the author of this pleasing volume open his first chapter. He obviously writes because of pure love of the subject. In an easy, colloquial, vivid, personal way the ordinary facts of our weather controls and weather types are described, and in a broad, general way they are also explained. There is nothing of the text-book here. It is all free and easy and unconstrained. It is refreshingly different. One may readily pardon the occasional inaccuracies in view of the merits of the book, which is so well up to date that it includes an account of the tornadoes and floods of March, 1913. We think that the effort to make the descriptions vivid and catchy is frequently overdone. For example, on page 62 we read: "Usually in the formation of a trough a center of low pressure up about the Great Lakes has entered into a kind of trust with one down in the neighborhood of the Gulf, and the combination holds ground in a rather dull, obstructive way, northeast and southwest, over the lower Mississippi and Ohio valleys, a business without, for the moment, any real head." Nor do we like "the body that scatters the air around and makes fair weather" (title to chapter VII). Yet we have no hesitation in saying that Mr. Martin's book may well be read by those who wish to become acquainted with the facts of "our own weather," and with their explanations. The cloud views are reproduced, in half-tones, from the colored Hydrographic Office cloud types, without, so far as we have discovered, any indication of the source from which they were taken. The colored views are so much better than Mr. Martin's and are so readily obtainable that some reference to them should have been made. But the author has strictly avoided references, so he is, at any rate, consistent.

R. DeC. Ward.

ANTHROPOGEOGRAPHY

Das Meer als Quelle der Völkergrösse. Eine politisch-geographische Studie. Von F. Ratzel. 2. verbesserte Auflage besorgt von H. Helmolt. iv and 91 pp. R. Oldenbourg, München, 1911. Mk. 1.80. 9 x 6.

This is the second edition of Ratzel's endorsement of strong naval armaments. The new edition has been brought down to date by Hans Helmolt, who has incorporated his revisions in Ratzel's text.

Writing at a time when Germany was undecided as to her naval policy, the author has marshaled his knowledge of geographical influences in the past to insist upon the necessity of vigorous maritime expansion. Although this was the main purpose, Ratzel has implied rather than expressed his Pan-Germanic leanings. In a series of essays of great literary charm, he has restated his familiar principles of the cosmopolitanism of maritime nations. He sees those

nations that were purely continental gradually becoming maritime as well, and arrives at the thesis that, more than ever in the past, the strength of a nation depends upon its combined land and sea power. On the whole, events since the writing of this pamphlet have verified its predictions to a remarkable degree. CARL O. SAUER.

Jenseits der Hochkultur. Ein Beitrag zur Wertschätzung der Menschheit. Von A. Sokolowsky. 84 pp. Ills. Deutsche Verlagsgesellschaft, Hamburg, 1912. Mk. 3. 9 x 6.

Few, in the present stage of knowledge of human societies, will hold to the former view that the spiritual life of man is a gift from outside and that morals designate his success in conforming his life in general to this external rule. Accordingly there will be hesitation in accepting Dr. Sokolowsky's position that the moral life arises from social and economic conditions. The subject is too great to be dealt with in a tract. The moral life is that which conforms to the public opinion of the community, and public opinion is always conservative and lags fondly with outworn creeds. The genesis of such public opinion and of the system of morals thereupon dependent becomes the great theme of those who study the life of primitive peoples. The author has directed attention to a few picturesque examples, just enough to remind us that sociology is scarcely practicable without ethnology.

WILLIAM CHURCHILL.

Homo Sapiens. Einleitung zu einem Kurse der Anthropologie. Von Dr. V. Giuffrida-Ruggeri. Autorisierte Übersetzung aus dem italienischen. vii and 198 pp. Map, index. A. Hartleben, Wien und Leipzig, 1913. Mk. 5. 9½ x 6½.

For several years Naples has been the center of the most recondite research into the origin of man, his development from genera lower in the scale of life, the modification of anthropoid types into the single genus and single species which at the present is considered to hold all the races of modern man. The Germans have translated for their own universities Dr. Giuffrida-Ruggeri's introduction to the science in which his countrymen lead and of which among them he is by no means the least distinguished worker. He announces opposing theories and reserves the argument of his own belief, yet his comment is illuminating upon each theory as he passes it under review. Steering a safe course between the polygenetics and the monogenetics he prepares the student by a clear statement of the elements now classed as taxonomic or variation due to external causes, and shows how much may safely be accepted of the newer theories and how much must be dealt with as yet on trial. Beginning with a distinct determination of what characters are hereditable he passes to a discussion of mutation and fluctuation phenomena and finally he considers the relative value of the taxonomic characters and the importance of the influence exerted by isolation. It is a most inspiring treatise. Students will find it a valuable array of the principal theories of the past of man. Readers who may not spare the time to prosecute further research will find this volume a most interesting setting forth of the sum of our present knowledge of the man who preceded us and from whose brute station we have taken our departure. WILLIAM CHURCHILL.

The Golden Bough. A Study in Magic and Religion. By J. G. Frazer. 3d edition. Part VI: The Scapegoat. xiv and 453 pp. Index. Macmillan & Co., Ltd., London, 1913. 10s. 9 x 6.

The prominent feature in this definitive edition of the last chapter in the study of the Dying God is that Dr. Frazer has removed the Crucifixion from its former position in the text and set it into an appendix. We are surprised at this half-way measure. The learned author brought upon himself a storm of protest by including the episode in his study of comparative religion. We feel sure that the mere change of position and the employment of a slightly smaller type will not satisfy in the least those who were shocked at the first

publication. Rightly or wrongly this will be the point upon which this new edition will be criticized. For the rest it remains the true encyclopedia of all that it is known on the theme of magic and other belief contained within the scope of the sacrifice for sin. As throughout the Golden Bough, we observe that all data are accepted at full value and, in places, this leads to false interpretation because the basic records lacked accuracy. WILLIAM CHURCHILL.

Lessons in Elementary Tropical Hygiene. For the use of pupils in tropical schools. By H. Strachan. xi and 116 pp. Ills., index. Constable & Co., Ltd., London, 1913. 1s. 7½ x 5.

An admirable book, written in the form of lectures for schools, using simple language, and dealing with diseases and how to prevent them; parasites, "germs," the blood, carriers of diseases, malaria and mosquitoes, the improvement of sanitation in the tropics, etc. As useful and interesting for most adults as for students.

The Jews of To-day. By A. Ruppin. Translated from the German by M. Bentwich. xxii and 310 pp. Index. H. Holt & Co., New York, 1913. 7½ x 5½.

The German work, of which the present book is an English translation, raises the question whether the Jewish people of to-day will be able to resist the disintegrating social and economic forces which tend to strip it of its religious and racial peculiarities, and to assimilate it in culture and civilization to the various peoples among which it is domiciled. The answer given to this question is a hopeful affirmative, tinged nevertheless with some little doubt. The hope arises from the natural predisposition of the writer to his inborn creed and race feeling. The doubt springs from his scientific training in sociology and economics, which makes him realize that social and economic forces are as resistless and as relentless as are molar, molecular, and atomic forces. He admits that the only hope of resisting the assimilating power of these forces lies in the back-to-the-land movement of present day Zionism. But it may be well doubted by all conversant with ethnology and sociology whether any attempt to infuse new life into a disintegrating nationality by any artificial methods of language revival, or territorial grouping, can succeed. The chapter on Zionism is most interesting. DAVID H. BUEL.

HISTORICAL GEOGRAPHY

History of Geography. By J. Scott Keltie and O. J. R. Howarth. vii and 208 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1913. 75 cents. 6½ x 4½.

A concise history of the beginnings and progress of geographical knowledge and the development of geographical science to the present time. On the whole, an excellent brief treatment of the subject by authoritative writers; with a short bibliography, which well might have been extended to include more of the fundamental German works. The book says (p. 141) that "the connection of the river Welle with the Congo system was established by W. Junker." It is a curious fact that Junker died in the belief that the Welle, which he traced from the west, finally turned north to the Shari-Chad basin. It remained for Van Gèle, to prove that the Welle-Mobangi is the largest Congo tributary.

ECONOMIC AND COMMERCIAL GEOGRAPHY

The Banana: Its Cultivation, Distribution and Commercial Uses. By W. Fawcett. With an introduction by Sir Daniel Morris. xi and 287 pp. Ills., index. Duckworth & Co., London, 1913. 7s. 6d. 9 x 6.

The author, who has been in close touch with banana planting for about thirty years and is an authority on the subject, has brought together here a large mass of information as to the distribution of the plant in many lands,

its cultivation and the development of the trade. The zone of the banana nearly girdles the earth and its régime in many lands is here described. We have heard much of the banana in Africa but Sir Harry Johnson is quoted in this book as saying that while the plantain is widely cultivated in that continent, the banana is not common and is of recent introduction, Arab or Portuguese.

Cocoa: Its Cultivation and Preparation. By W. H. Johnson. Imperial Inst. Handbooks. ix and 186 pp., index. John Murray, London, 1912. 5s. 9 x 6.

Mr. Johnson says that the cacao tree thrives best in a hot, equable, moist climate with a well-distributed rainfall. Its cultivation is limited to lands lying between 20° N. lat. and 20° S. lat. Within these parallels the industry is seldom profitable at a higher elevation than 2,000 feet, nor where a protracted dry season occurs. As it is, there are more than 2,000,000 acres under cacao cultivation.

With this important industry the author deals in a careful and detailed manner. Among the many topics are the climatic and soil requirements of cacao trees, laying out a plantation, shading and inter-crops, propagation and general cultivation, fertilizing, diseases, harvesting, fermentation, washing and sun-drying, amount of yield, initial and running expenses of a plantation, manufacture and uses of cocoa. The work is illustrated with photographs.

WILBUR GREELEY BURROUGHS.

All About Coconuts. By Roland Belfort and A. J. Hoyer. xii and 201 pp. Ills., index. St. Catherine Press, London, 1914. 6s. 9 x 6.

The cultivation of the cocoanut is one of the great and growing industries. Its annual value is now twice that of the rubber industry and has nearly doubled in the past few years. This book gives a full account of the cocoanut and its various products, its commercial value, diseases, pests, development and profits of the industry, fertilization, methods of marketing, etc.

The Farmer of To-morrow. By Frederick I. Anderson. vii and 308 pp. The Macmillan Co., New York, 1913. $1.50. 7½ x 5½.

In a recent address before a conservation congress, Ex-President Taft predicted that the United States will have attained a population of 200,000,000 in another fifty years, at the present rate of increase. This being true, can enough food products be raised in the United States to feed this multitude? Mr. Anderson shows that enough food products can be raised. He points out that less than one-half of the 900,000,000 acres owned by the farmer of to-day is improved; and nearly two-thirds of this land, counted as farm land, has not yet been called on to produce food. Also, there are swamps, forests, arid, and semi-arid lands that can be reclaimed and made productive. Thus without increasing the efficiency of its cultivated land, the United States still possesses enough resources of land as yet untilled, to feed double the population of to-day.

With the subject of our present farming system and the reclamation of our waste areas, the author deals at length, treating these questions from an economic viewpoint. Having solved the problem regarding the acreage necessary to support the people of the United States in the rather near future, the author takes up another issue of vital importance. According to the most generally accepted theory of soil fertility the elements necessary for plant growth must be added to the soil or the soil will eventually become infertile. These food elements have been added in great part by minerals mined from the earth. These deposits, however, will become exhausted, and with no added commercial fertilizer, great areas of farm land will cease to produce crops, simply because the food upon which the plant exists is no longer in the soil. A recent theory has been advanced, supported with numerous experiments by the United States Bureau of Soils, that does away with the gloomy prospect of ultimate starvation. The new theory states that potash, phosphorus, and calcium are present in the soil in inexhaustible quantities and are

at all times soluble, ready for plant consumption. It is deleterious substances which form in soils that render the land unproductive, and not that the food elements have become exhausted. The most widely found toxin is a compound called dihydroxystearic acid. It has been found that on injecting this acid into a fertile soil, the soil will become infertile. Sterilizing agents, however, have been discovered that will restore the soil to fertility; but for a detailed account of the subject, one must read this most interesting book. WILBUR GREELEY BURROUGHS.

The Use of Vegetation for Reclaiming Tidal Lands. By Gerald O. Case. 36 pp. Ills. Reprinted from *Engineering,* Aug. 22 and Sept. 12, 1913. London, 1913. 2s. 7½ x 5.

"It is probable," says Mr. Case, "that in the near future 2,000,000 acres of excellent land will be won from the sea to agriculture." This is to be accomplished by vegetation on the foreshore transforming the bare sand or mud into salt marshes. This work will be carried out in estuaries, sheltered bays, areas between islands and the mainland, and on the lee side of shingle or sand spits. A salt marsh having been formed and built up to ordinary high-tide level by vegetation, "it can then be reclaimed by an inexpensive embankment constructed to prevent the land from being overflowed by high spring tides." It has been customary in the past to wait until the original vegetation has covered the foreshore, but Mr. Case suggests that by planting suitable vegetation, large areas, covered by high tide, which now are void of plant life would, at small cost, be formed into salt marshes and could eventually be enclosed by an embankment. An account is given of coasts in various stages of reclamation, the plants most useful for this purpose, and in fact everything pertaining to the subject. The book should prove of practical value.

WILBUR GREELEY BURROUGHS.

Date Growing in the Old World and the New. By Paul B. Popenoe. With a chapter on the food value of the date by Charles L. Bennett. xviii and 316 pp. Ills., index. West India Gardens, Altadena, Cal., 1913. \$2. 8½ x 6.

An authoritative book on an industry that is now prominent in our own country and is certain to become one of the largest fruit enterprises in California and Arizona. For two years the author was gathering his material in the most famous date growing regions of the Orient, having been appointed to this mission by the West India Gardens of Altadena, California. After thirty pages given to brief descriptions of the regions in which commercial date growing is now an established industry, the author describes the propagation of the date palm by offshoots and by seed, its culture in which irrigation is the chief item, pollination, handling the crop, artificial ripening, diseases and pests, the classification of dates, profits of the industry, Arab uses of the date, its food value, and date varieties. The book is finely illustrated, but a good map showing the distribution of the date would have been advantageous.

Natural Sources of Energy. By A. H. Gibson. 131 pp. Maps, ills., index. (Cambridge Manuals of Science); G. P. Putnam's Sons, New York, 1913. 7 x 5.

This little work on the world's energy problem is not technical and is adapted for general reading. Discussing sources of energy that will remain to the human race after coal, petroleum and peat are exhausted, the author treats of (1) energy leaving the sun, and reaching the earth as radiant heat; (2) energy of fuels such as vegetable fibres and oil, timber and alcohol of which a permanent supply will exist so long as present seasonal and climatic conditions continue; (3) heat energy stored in the earth; (4) the energy of rivers and waterfall; (5) the energy of the waves of the sea; (6) the energy of the wind. Most of the book is given to an examination of these supplies of energy and of their possibilities as factors in any general power scheme. His main conclusion is that, even when the fossil fuels are exhausted, ample supplies of energy, renewable year by year, will remain for all the activities of the human race. The book is a worthy contribution to the subject it treats.

Ocean Trade and Shipping. By Douglas Owen. Cambridge Naval & Military Series. ix and 277 pp. Map, index. University Press, Cambridge; G. P. Putnam's Sons, New York, 1914. 10s. 6d. 9 x 6.

This book is an attempt to cover for college students the whole field of "trade and shipping" as an Englishman conceives them. The field is pretty well stretched, too, for some of the students to whom the author is a lecturer are prospective naval officers and are expected to know about the ships' papers in war as well as in peace. There is also a full fourth of the book devoted to Lloyd's and insurance.

The first part of the book, dealing with ports, port competition, port construction, and the influence of natural factors on their construction and use, is most likely to be of interest to geographers. This book with its 71 short chapters ranging from Ports to Passenger List and the Insurance of War Risks is the first volume to which one should turn who wishes light on the operations of ships and shipping. It is well indexed and contains a reproduction of a typical page of Lloyd's register, a bill of lading, and a charter party.

The author, who has previously written a book on docks, is a master of the facts about ship operation, and he also is one of the few who writes with mastery of traffic and rates. His six-page discussion of "shipping rings and rebates" is an excellent short presentation, but the discussion of Mr. Morgan's International Mercantile Marine seems to be needlessly academic for one whose experience had brought him so close to the facts.

J. RUSSELL SMITH.

Rubber and Rubber Planting. By R. H. Lock. xi and 245 pp. Ills., index. G. P. Putnam's Sons, N. Y., 1913. $1.50. 7½ x 5.

A comprehensive and at the same time a concise account of the rubber industry, intended to advance the intelligent cultivation of the trees and the harvesting of the product. Considerable emphasis is laid on the physiology of latex production. A knowledge of this ought to help the planter to avoid injury to his crop and to prevent a diminution of the yield. Planting operations in all the many phases and protective measures against pests and diseases round out the presentation. Brief chapters on the chemistry of india-rubber and manufacture of rubber goods end the volume. The book, while it makes a special appeal to manufacturers and planters, would be a proper and valuable addition to any reference library on commercial and industrial geography.

ROBERT M. BROWN.

Coconut Cultivation and Plantation Machinery. By H. L. Coghlan and J. W. Hinchley. x and 128 pp. Ills., index. Crosby Lockwood & Son, London, 1914. 7 x 5.

This is largely the experiences of a manager of Malayan estates and is intended to supply the planter with a guide for the various stages of the cocoanut industry. It includes, besides the discussion pertaining to the raising of the trees, such as the soil, its preparation, seed nuts, pests and cultivation, many valuable suggestions concerning the marketing and possibilities of manufacturing of the crop as well as catch crops which will yield a revenue during the years of growth of the trees. Many tables and estimates are inserted to guide the planter, and a review of the industry in the West Indies yields a broader view of the field and conditions. ROBERT M. BROWN.

The Fertility of the Soil. By E. J. Russell. Series: Cambridge Manuals of Science, etc. 128 pp. Ills., index. G. P. Putnam's Sons, New York, 1913. 6½ x 5.

Beginning with a history of the formation of the soil, the author proceeds to a consideration of the formation of plant food in the soil; soil fertility; and the six requirements necessary for the best plant growth, that is, water, air, temperature, food, root room, and absence of harmful factors, each of these topics being discussed briefly. He also considers the various types of soils, medieval farm practice, the general bearing on the fertility of the soil of modern agricultural systems, the limit of the productiveness of soils and

how this limit can be raised, fertilizers to be used, special treatment for clays and sands and reclamation of moorland.

The work is illustrated with a number of photographs. The author is Director of the Rothamsted Experiment Station, and should know concerning that of which he writes. His treatment of the subjects under discussion are clear and simply told. WILBUR GREELEY BURROUGHS.

Allgemeine Verkehrsgeographie. Von Kurt Hassert. viii and 494 pp. Index. Maps, index. G. J. Göschen, Berlin, 1913. Mk. 10.

The book attempts—and very successfully, too—to work out a system of the geography of traffic, examining the geographical foundations of the existing traffic conditions as evidenced in the interdependence of traffic, man, and nature. It is divided into four parts: the first, more theoretical in character, is a study of traffic in general as one of the geographical phenomena on the surface of the earth, *e.g.*, a phenomenon of locomotion. The following definition of traffic is given: "The locomotion, mostly for economic purposes and by special means of transportation, of all kinds of objects, *viz.*, people, goods, and ideas (news), from some place of issue to a place of destination, in order to establish an exchange of the natural resources of earth and man." Thus traffic becomes the natural foundation of commerce, just as the latter is the principal stimulus for traffic. The two are interdependent. The need of an exchange increases in proportion with the differences of soil, climate, and people of any two given countries. The geography of traffic is therefore part of economic geography, just as traffic is of economics. Its special object is to describe the geographical distribution of the lines, means, and places, of traffic and to explain their existence by virtue of the existing natural and cultural conditions. Under the influence of those conditions traffic has developed from local to interurban, national, international, continental, and world traffic, of which at present four-fifths is carried on by water and one-fifth only by land. Its highest types are found in connection with the highest culture, and the flag often follows it.

The fundamental geographical factor in traffic is distance. Distinction must be made between mathematical or geographical (air-line) distance and economic or actual distance, the latter meaning the time which is needed to get goods or people from one place to another. As traffic is apt to follow, not always the shortest, but rather the easiest line, the latter is the more important. It depends upon the quality of the road, the means of transportation, the geographical character of the intervening country, political conditions, scarce or dense population, vegetation, composition of the soil, etc. To illustrate these actual or economic distances is the object of the so-called isochronal or isotimal charts, *viz.*, charts indicating the distances which traffic can cover in a given time, the isochronal lines connecting the places which are reached within the same time from a given center.

Not only the distances, but also the means and ways of transportation are geographically determined, in the first place by the climate (camel, sleigh, etc.). As the degree of civilization of the inhabitants determines the greater or lesser density of traffic, and the degree of perfection of its ways and means, a climate unfavorable for the development of a higher civilization will also be unfavorable for traffic.

The maximum which traffic may reach in any part of the world is largely dependent upon geographical location. Europe and North America, for instance, will always be favored countries in this respect on account of the easy access which they have to the most important countries by land or sea.

The second, third, and fourth parts of the book are given over, respectively, to the special description of land traffic, ocean traffic, and the traffic of news, which is quite a new aspect in geography. In the second part, special chapters are devoted to the continental roads, caravan routes, and the development, economic geography, and geographical distribution of railroads. The railroad systems of each continent, as well as the inland waterways, are treated in separate chapters. The third part contains chapters on the history of ocean navigation, the geographical importance of the oceans, the most im-

portant navigation companies, the routes of sailing vessels, piracy, seaports, the influence of straits and isthmuses on shipping routes, the Kaiser Wilhelm, Suez, and Panama Canals. The fourth and last part discusses the languages of traffic, the geographical foundations of the mail service, telegraph, telephone, and cable lines.

The text is illustrated by twelve maps and diagrams, and the rich information which it conveys is made accessible by an elaborate index of names and subjects. It ought not to go unnoticed that of all the books treating with such a "dry" subject this is the first, to my knowledge, in which the author has succeeded in presenting the matter in a way which is not only instructive but also attractive and pleasant to the general reader. M. K. GENTHE.

METHODOLOGY AND TEACHING

The Clarendon Geography. Vol. 2, Part 4: Asia. Part 5: Africa and Australasia. Part 6: America. viii and 376 pp. Maps, ills., index. Clarendon Press, Oxford, 1913. 75 cents. 7½ x 5½.

In this, the second and last volume of the Clarendon Geography, the author considers the continents of Asia, Africa, Australasia, and North and South America. For each of these continents the general physiográphy, climate, plants, animals, and man are taken up, as well as a somewhat detailed study of the political divisions. At the end of each chapter are a number of interesting exercises for class-room and laboratory use, which serve to emphasize important points in the chapter just completed. Numerous well-chosen maps, some of them colored, diagrams, tables, and photographs add to the value of the work. WILBUR GREELEY BURROUGHS.

Handelsgeographie. Von Fritz Regel. 6th edit. xv and 500 pp. Index. W. Violet, Stuttgart, 1913 (?). Mk. 4. 7 x 5.

Professor Regel's book, now in the sixth edition, has been considerably expanded. Like many other German texts on commercial geography, it is compacted with facts including general geography; but, like some other German texts, it fails to connect closely the facts of geography with commerce and trade. The teaching of commercial geography in our country tends more and more to the correlation of geographical data with commerical and economic development and to a clear setting forth of the principles upon which such development depends. This book, on the other hand, has an enormous mass of excellent data, but much of it is simply raw material with no attempt to apply it.

Elementary Commercial Geography. By Hugh R. Mill. Revised by Fawcett Allen. xii and 215 pp. Index. University Press, Cambridge; G. P. Putnam's Sons, New York, 1914. 1s. 6d. 7 x 5.

This book, in its first edition, was one of the earliest text-books of commercial geography Its statistics have now been brought up to date, and more detailed descriptions are introduced of those countries which have shown recent commercial development. The first fifty pages devoted to "General Principles of Commercial Geography" still hold their place as one of the best short treatments of the subject.

A Commercial Geography of the World. By O. J. R. Howarth. Series: The Oxford Geographies. 236 pp. Maps, index. Clarendon Press, Oxford, 1913. 2s. 6d. 7½ x 5.

The basis for a good commercial geography is here in outline, but not in text. The text lacks solidity. It is not well knit. Like so many other "commercial" geographies, this one is largely an enumeration of products with a statement as to their distribution.

Fig. 22, "Diagram of Main Transcontinental Railways in Western Europe," is good. The maps in general, however, lack parallels and meridians or, when shown, do not include the degrees represented by them.

A few errors may be noted that unfortunately are almost characteristic of the book. On page 141:—"The greater lake vessels, called 'whale-backs,' carry cargoes up to 250,000 bushels." Whale-backs are practically a thing of the past on the Great Lakes, being now replaced by great steel steamers that carry upwards of 400,000 bushels. Again, p. 195:—"Minnesota leading among all the states in wheat production." This is no longer true and has not been for several years. The introductory chapters would lead one to believe that the book is to treat of the dependence of commerce on climate. However, after five chapters, the author leaves this phase, returning to it for a while only in the 14th chapter and again in the 16th to 18th chapters. EUGENE VAN CLEEF.

Erdkunde für höhere Schulen. Von Heinrich Fischer, A. Geistbeck und M. Geistbeck. Ausgabe E. In 6 Teilen. 1. Teil: 90 pp. 70 pfg. 2. Teil: 97 pp. 75 pfg. 3. Teil: 78 pp. 75 pfg. 4. Teil: 54 pp. 60 pfg. 5. Teil: 51 pp. 50 pfg. 6. Teil: 132 pp. 90 pfg. Maps and ills. in each. R. Oldenbourg, Berlin & München, 1912. 8½ x 6.

The first part of this work gives a glimpse of the world and a fuller view of Central Europe, seeking to begin with pictures and descriptions of things selected as of geographical importance. The second treats the rest of Europe in the same way, but tries to bring out relations—how geography affects men in some important cases rather than to tell a mass of details. Then follow four parts "for schools that give geography an hour a week," (3) other continents and the German colonies, (4) the German Empire, (5) recent economic development of Europe, with mathematical geography, and (6) review and anthropological matter. All through a few things are sought out and found, the things that seem to matter. The pictures illustrate this, for their selection is excellent. They are not especially abundant, from our American point of view, and not all of them are well made, but they show great progress toward that little group of typical pictures that all geography teachers ought to have at hand. The choice of these pictures would justify purchasing the series for them alone. Especial interest in the text attaches to it as a very intelligent effort to escape from smothering detail. MARK JEFFERSON.

Blackie's Elementary, Regional and Practical Geographies. By David Frew. Africa and Australasia; Asia; General Survey of the World; North, Central, and South America. iv and 80 pp. and maps in each. Blackie & Son, Ltd., London, 1913. 6d. each. 7 x 5 each.

These four volumes together form, with the exception of the treatment of Europe, a fairly complete comprehensive outline of the physical geography of the world for elementary students. Volume one is a brief outline or summary of physical geography, including the usual contents. In the other volumes the continents are discussed *in extenso* from the standpoint of physiography and then some details of political and economic conditions are given. The matter presented, however, though well systematized and ordered, is in many cases expressed in so precise and formal a manner as to be of little service to the pupils. As a reference volume for a hurried teacher the volumes would be of use. RICHARD ELWOOD DODGE.

The Junior Scientific Geography. Book 1: Physical Geography. By Ellis W. Heaton. viii and 152 pp. Ralph, Holland & Co., London, 1911 (?). 1s. 3d. 7½ x 5.

Teachers of physical and mathematical geography should find this book helpful. It is suggestive and original in its treatment of the subject matter and its value is increased by a large number of interesting and instructive diagrams. The book has only five chapters, but the text is written in concise style and contains more than the chapter headings suggest. The chapter on map work covers the subjects of projections, contour maps, sections and map-making. The presentation of this material is new and can easily be put into practice. Other chapters take up the earth as a whole, division of land and water, the atmosphere and water on the earth. In the 152 pages there are

over 160 illustrations. The illustrations are all simple, sometimes crude, but they have good explanatory value and can be easily transferred to the blackboard during the progress of the lesson.

The value of the book lies in the new and vigorous handling of topics which have been made uninteresting to pupils through the lack of proper methods of presentation and in the vivifying of lessons ordinarily considered too difficut for the pupils of the grades. ROBERT M. BROWN.

The Teaching of Geography in Elementary Schools. By R. L. Archer, W. L. Lewis and A. E. Chapman. 255 pp. Index. Macmillan Co., New York, 1910. $1.10. 8 x 5.

Here is a volume filled with sound, stimulating advice for the geography teacher in elementary schools of Great Britain. The authors show they are intimately acquainted with the limitations and possibilities of grade pupils, the extraordinary deficiency in geographical equipment of the average elementary teacher, and with the modern concept of the subject. They indicate the first by suggesting a carefully worked-out course of study that is progressive and nicely adapted to the abilities of the children; the second, by giving very minute direction as to method and material, and a vast amount of subject matter that occupies more than half of the book; the last, in emphasizing the causal element in geography, by giving climate the largest place among the factors, and always keeping the life responses to the front. A permanent interest in geography is declared to be one of the main aims in teaching the subject. If even less-than-the-average teacher follow this book carefully such an end would seem difficult to miss. SUMNER W. CUSHING.

The Teaching of Modern Subjects: Geography. By James Welton and W. P. Welpton. University Tutorial Series, pp. 278-358. Index. University Tutorial Press, Ltd., London, 1912. 1s. 7 x 5.

An admirable little book of suggestions, especially for Yorkshire, where the author lives (Leeds). Out-of-door work is urged as essential from the start and very practical suggestions are given what to do by hill and stream. Mr. Welpton has a high ideal of the utility of geography for man's culture and thinks of it as the study of man in relation to the earth rather than of the earth in relation to man.

He shows how the study of a locality may lead to a notion of the whole country and the world beyond. London as a center is considered: "No abstract treatment of this conception should be attempted. Only broad, plain facts that can be exemplified by people, events, and buildings should be noticed." He believes in the concrete and realizes the advantages of illustration for beginners. He would "illustrate" the roundness of the earth, not "demonstrate" it.

The two climatic bugbears, "Hot air rises" and "Moist winds against cold mountains give rain," come in for merited condemnation. A good book.

MARK JEFFERSON.

A Laboratory Manual of College Geography By Lawrence Martin, E. F. Bean and F. E. Williams. xiv and 238 pp. Maps, index. University of Wisconsin, Madison, 1913. 70 cents. 10 x 7½.

Professor Martin and his colleagues have prepared and printed the first American manual for college geography teaching, and have thereby testified to the advance and lack of progress in geography teaching in American colleges and universities. The book is planned for a half-year of laboratory work and includes fifty-one exercises, of which thirty-one are devoted to Europe, seven to Asia, six to North America and the remainder to Antarctica, Australia, Africa and South America.

Each exercise includes questions with spaces for replies, and many of the exercises are based on outline maps, with which the text is well supplied.

The exercises are well planned and present in clear and usable form many of the facts of geography which should be a necessary part of the equipment of every college student. Many of them present large problems that require

thought and advanced training in physiography and geology. The questions will be generally approved as pertinent to the needs of the pupils for whom intended.

But what a testimonial many of these necessary exercises are as to the deplorable status of secondary school and college geography in this country! For instance, Exercise IV, devoted to the German Empire—General, could be done easily by a well-equipped pupil in the seventh or eighth grade of the elementary school. The questions call upon the student to name the countries bordering Germany; to print in the names of the bordering waters, rivers, mountains and cities; to measure areas by using map scales and compare with the area of Russia and Wisconsin; and to compare the density of population of Germany and Wisconsin. Other questions are, "What parts of the boundary of Germany are natural?" "Is the North Sea or the Baltic the more desirable for seaports? Why?" "Name some ports on the North Sea, on the Baltic," and several more of a similar degree of difficulty. The principal reference text is an elementary school geography.

In previous training in geography and in adequate materials for advanced study our college students are woefully handicapped. This manual is a most commendable contribution toward strengthening college geography, and the exercises based on detailed map study are excellent and advanced in type. Yet an examination of the exercises shows that advanced work is far more possible in physiography than in regional or commercial geography.

The volume is a distinct contribution to geographical education and the authors are to be complimented for their success in blazing a new trail. May equally adequate opportunities for better work soon be furnished through texts and atlases of an advanced type. RICHARD ELWOOD DODGE.

An Elementary Geography of Scotland. By Marion I. Newbigin. Series: Oxford Geographies. 135 pp. Maps, ills., index. Oxford University Press, New York, 1913. 40 cents. 7½ x 5.

An excellent little book for beginners in geography in Scottish schools and a good model for home geographies in any country or state. Simple and interesting in manner of presentation, causal relations nicely brought out, physical and human geography well balanced and correlated, summaries, questions and exercises at the end of each chapter, telling illustrations, and having the topics so arranged that there is a broadening and building up of ideas as you advance.

R. H. WHITBECK.

Principles and Methods of Teaching Geography. By Frederick L. Holtz. xii and 359 pp. Maps, ills., index. Macmillan Co., New York, 1913. $1.10. 7½ x 5.

A sane, mildly conservative, fad-free discussion of the teaching of geography in the elementary school. While it makes no attempt to blaze new trails, it stands for geography in the strictly modern sense. The author's ideas on the teaching of geography are likely to commend themselves very generally to teachers, for he advocates no radical departure from the practices of the best teachers, presents no cure-alls, and freely recognizes merits in the various "methods" of teaching the subject. He urges the emphasizing of human geography and the subordination of mathematical and physical in the grades; holds that it is, in ordinary schools, futile to teach only through the type study method; recommends the use of the text book as probably a safer guide than any that the teacher can prepare, but recognizes that even the best text book is of necessity a compressed, laconic, treatment. He advocates the correlation of nature study and geography in the lower grades and holds that history and geography are inseparable. These and many other tenets in the author's creed are sound if not new. In fact, there is little if any new ground broken. The book shows clear, well-balanced thinking and a wide knowledge of the pedagogical and historical aspects of geography.

The list of geographical books in Chapter XXV is not sufficiently critical. For example, under "Books of Method," the first title given is Davis's "Geographical Essays," the most advanced treatise in English. The next book

in the list is Frye's "Child and Nature," one of the most elementary of books. Yet nothing indicates that the books are not of the same general class. Dates of publication ought to appear, at least with the older books. The book ought to serve a useful purpose in a number of ways—in normal and training schools, in reading circles and in the hands of teachers. If its main suggestions were generally practiced, geography teaching in America would be improved.

R. H. WHITBECK.

OTHER BOOKS RECEIVED

These notes do not preclude more extended reference later

NORTH AMERICA

THE AMERICAN COLONIES 1583-1763. By A. W. Tilby. Series: English People Overseas, Vol. 1. 2nd edit. 302 pp. Constable & Co., London, 1911. 4s. 6d. 8½ x 5½.

THE IMPORTANT TIMBER TREES OF THE UNITED STATES. A manual of practical forestry. By S. B. Elliott. xv and 382 pp. Ills., index. Houghton Mifflin Co., New York, 1913. 8 x 5.

AFRICA

LA CONQUÊTE DE L'ALGÉRIE. Par J. Mazé. 398 pp. Ills. A. Mame et Fils, Tours. 14s. 6d. 12 x 9.

LE "COUP" D'AGADIR. Origines et développement de la crise de 1911. Par P. Albin. iii and 396 pp. Index. F. Alcan, Paris, 1912. 7½ x 5.

VOYAGE AU PAYS DES SENOUSSIA. À travers la Tripolitaine et les pays Touareg. Par le Cheikh Mohammed Ben Otsmane El-Hachaichi. Traduit par V. Serres et Lasram. 2nd edit. 316 pp. Index. A. Challamel, Paris, 1912. 4s. 9d.

GUIDE DE L'OFFICIER MÉHARISTE AU TERRITOIRE MILITAIRE DU NIGER. Par Capitaine Bouchez. Gouv. du Haut-Sénégal et Niger. xiii and 307 pp. E. Larose, Paris, 1910. 10 x 6½.

A RESIDENT'S WIFE IN NIGERIA. By Constance Larymore. 2nd edit., revised. xviii and 299 pp. Map, ills., index. E. P. Dutton & Co., N. Y., 1911. $1.50. 8 x 5½.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

NORTH AMERICA

UNITED STATES

United States. Aberle's Railroad, Financial, Commercial and Statistical Map of the United States and parts of the Dominion of Canada and Mexico. Designed by Edward Aberle, Geographer and Engraver, West Nutley, N. J. 1:3,168,000. 55½° - 23° N.; 131° - 58° W. 68 colors. Published by the Brett Lithographing Co., 605-611 West 129th St., New York, 1908. (Price $15.00.)

[The second, third and fourth qualifying adjectives of the title should be considered subordinate to the first, for the map is exclusively a railroad map. As such, it is by far the best of its class that has come to the reviewer's notice. Each railroad system is shown by a distinctive symbol in color. No less than 123 railroad systems are shown, and still each can be traced with perfect clearness. This is due to the great flexibility of the system of symbols used. Although only five colors are employed—red, blue, yellow, green and brown—, by an ingenious use of various patterns, supplemented by similar devices in black, the remarkable number of 63 distinct symbols has been evolved, which, by judicious use of the same symbol for non-contiguous systems, suffices to represent all the railroads of the country. The width of line used—2 millimeters for the trunk lines and 1 millimeter for the others—lends firmness to the delineation while not detracting from its accuracy. Clearness and pleasing effect are attained by never allowing the colored lines to cross each other: by interrupting the color of one line where it would cross another, the lines are given the appearance of going over or under each other. These and other matters, such as the selection of the colors used and the perfect register obtained, show that the author has artistic sense—a quality indispensable in cartography as in the other graphic arts. This admirable execution insures clear expression of the content. The map will be found invaluable in ascertaining which railroad routes are used between various points. Maps which do not differentiate between railroad systems—such as the U. S. Geological Survey base map, 1:2,500,000, to which one would naturally turn—simply show where railroads exist, or, if they do indicate the name of a rail-

road along its route, as does the Century Atlas and similar atlases, it is a rather tedious task to pick out the line one wishes to follow. The alternative of looking up a standard time table manual, such as the National Railway Publication Company's *Official Guide of the Railways of the United States, etc.*, is no less time-consuming. All such questions the present map answers at a glance.]

AFRICA

Morocco. Marruecos: Región S. O. al sur del Rio Tensift, por el Teniente Coronel (retirado) de Estado Mayor Don Eduardo Alvarez Ardanuy. 1912. 1:500,000. 32°5′-27°30′ N.; 14°40′-7°25′ W. 3 colors. With 15 insets: (1) Mogador (Es-Suira). [After] Comisión del Cuerpo de E. M. del Ejército en Marruecos. 1895. 1:20,000. [31°30′ N. and 9°45′ W.]. 4 colors. (2) Marruecos (Marrakex). [After] Capitán de E. M. Alvarez Ardanuy. 1894. 1:50,000. [31°40′ N. and 8°0′ W.]. 4 colors. (3) Desembocadura del Uad Dra. [After] Gatell. 1865. 1:50,000. [28°42′ N. and 11° W.]. 2 colors. (4) Aguelmin. [After] Gatell. 1864-65. 1:10,000. [28°57′ N. and 10°4′ W.]. 4 colors. (5) Agadir Iguir. [After] Gatell. 1864-65. 1:20,000. [30°27′ N. and 9°37′ W.]. 3 colors. (6) Saibajarsa ó Saheb el Hárxa. [After] Gatell. 1865. 1:20,000. [28°28′ N. and 10°20′ W.]. 3 colors. (7) Puerto de Sta. Cruz de Mar Pequeña. Según D. Antonio Ma. Manrique. [1:82,000]. [28°3′ N. and 12°13′ W.]. 2 colors. (8) Tarudant. [After] Gatell. 1864. 1:40,000. [30°30′ N. and 8°50′ W.]. 4 colors. (9) Uina ó Méano. [After] Gatell, 1865, y Boletín de la Sociedad Geográfica de Madrid, memoria del Señor Fernández Duro, Marzo de 1878. 1:10,000. [28°30′ N. and 11°18′ W.]. 3 colors. (10) Uad-Xebika. [After] Gatell. 1865. 1:50,000. [28°20′ N. and 10°29′ W.]. (11) Tarfaya; Las Matas de Sn. Bartolomé. [After] Gatell. 1865. 1:20,000. [27°57′ N. and 12°54′ W.]. (12) Asaka. [After] Comandte. E. M. Jáudenes. 1883. 1:50,000. [29°10′ N. and 9°21′ W.]. 2 colors. (13) Uadkesis. [After] Jáudenes. 1883. 1:40,000. [29°15′ N. and 10°16′ W.]. 2 colors. (14) Ifni. [After] Jáudenes. 1883. 1:50,000. [29°20′ and 10°9′ W.]. 3 colors. (15) Sid Mohámed Ben Abd-al-Lah. [After] Jáudenes. 1883. 1:40,000. [29°33′ N. and 10° W.]. 2 colors. In 4 sheets. Constitutes Vol. 56, 1914, No. 4, of the *Bol. Real Soc. Geogr. Madrid.*

[Valuable map on a relatively large scale, based mainly on route surveys, comprising the region (south of 32° N. and west of 7½° W.) where the High Atlas and the Anti-Atlas abut upon the Atlantic. The scale is the same as that of the standard map of Morocco published by the French Service Geographique de l'Armée; the area shown is there covered by sheets "Marrakech" and "Oued Noun" (see, under "Morocco," *Bull.*, Vol. 44, 1912, p. 477). Routes surveyed by Spaniards are shown in red, others in black. Relief is in brown shading, hydrography in blue, towns and tribal names in red. The insets comprise the larger towns and roadsteads. Of these, the former recall the pleasing style of the topographic map of Spain, as is natural, inasmuch as the map was engraved and printed in the Instituto Geográfico y Estadístico. The sources (enumerated at the bottom of the map) seem, on the whole, somewhat old.

The meridians shown refer to Madrid; on the upper edge of the map they are correlated with longitude from Greenwich. The values given for the latter are incorrect, however: the meridian designated 6°30′ W. from Greenwich is actually in 7°52½′ longitude, for instance, and so on for the rest of the figures. The error may possibly be due to a double slip: first, the use of an old, incorrect longitude for Marrakesh, 7°36′ W., and then the incorrect labeling of the meridian thus drawn as 6°30′ instead of 7°30′ (Marrakesh is shown as lying in 6°36′ W. from Greenwich). The longitudes from Madrid are correctly designated; they do not always, however, seem to be based on the latest determinations. Marrakesh, for instance, correctly interpreted, is shown in longitude 7°58′ W. from Greenwich, while such recent maps as the French army map, referred to above, or Barrère's map, listed below under "Morocco," give its longitude as 8°2′ W.]

Morocco. Maroc: Carte dressée sous la direction de Henry Barrère, Editeur-Géographe. Dessinée par Paul Lefèvre. 1913. 1:1,000,000. 36° - 28° N.; 12° W. - 0°. 7 colors. With two insets: (1) Plan de Fès. [1:26,000]. [34°5′ N. and 4°57′ W.]. 5 colors. (2) Plan de Marrakech. [1:26,000]. [31⅝° N. and 8° W.]. 3 colors. Printed by Erhard Fres., published by the Maison Andriveau-Goujon (Henry Barrère, Editeur), 21 rue du Bac, Paris.

[Excellent large-scale general map of Morocco based on the most recent data. The map, which is in the manner of French colonial maps, has the usual pleasing appearance of the best maps of that class. Relief is in approximate contours in brown, supplemented by shading in gray; drainage is in blue, roads and market towns in red, other towns and tribal names in black. The *erg*, or sand desert, surfaces are shown in buff. The felicitous use of the millionth scale, as in the case of the map of the adjoining region listed below (Spanish Sahara), adds to the constantly growing number of comparable maps, even before the publication of the corresponding sheets of the International Map of the World.]

Nyasaland-German and Portuguese East Africa. (a) Versuch einer Geologischen Karte des Njassa-Gebietes. 1:1,000,000. 8½ - 15¼° S.; 33° - 36° E. 12 colors.

(b) Orographische Skizze des Njassagebietes. Same scale and coordinates as map (a). 16 colors.

(c) Der Njassa-Graben. 1:7,000,000. 7½° - 15° S.; 31¾° - 36° E.

(d) [Seven maps of the northern half of the Lake Nyasa region, 1:3,000,-000 (except Nos. 6 and 7, which are 1:5,000,000), limited by 8¾° - 11⅘° S. and 33° - 35⅘° E., entitled:] (1) Verteilung der Winde im Januar. 1 color. (2) Verteilung der Winde im Juli. 1 color. (3) Vegetations-Karte. 7 colors. (4) Verbreitung der Hüttenformen. 9 colors. (5) Verbreitung der Wirtschaftsformen. 7 colors. (6) Nutzbare Mineralien. (7) Vorkommen von Tsetse u. Schlafkrankh.

(e) Regen-Karte: Rohe Jahresmittel. [1:3,000,000]. 8½ - 17° S.; 32⅗° - 36½° E. 6 colors.

Accompany: maps (a) and (b) as Karten 1 and 2, respectively, maps under (d) and (e) as Karten 3 to 10, on one sheet, and map (c) as text map on p. 7, "Der Njassasee und das Deutsche Njassaland: Versuch einer Landeskunde" by G. Frey, *Ergänzungsheft Nr. 10, Mitt. aus den Deutschen Schutzgeb.*, 1914.

[Valuable maps illustrating various phases of the geography of the Lake Nyasa region. Maps (a) and (b) summarize, on a relatively large scale, all present knowledge as to the geology and relief of the district. The hypsometrical coloring on map (b) is graduated for every 250 meters. The legend gives the absolute elevation of the lowest land tint as 500-250 meters, which is incorrect, as the altitude of the lake surface is 478 meters, as stated in the text itself (p. 8). On map (e) six degrees of rainfall are distinguished.]

Spanish Sahara. (a) Sáhara Español y Región Inmediatos. Por Enrique d'Almonte. 1914. 1:1,000,000. 29° - 20° N.; 19° - 7° W. 7 colors. In 4 sheets.

(b) [Three charts:] (1) Puerto Cansado. 1913. 1:100,000. [28°5′ N. and 12°12′ W.]. (2) Fondeadero de Tarfaya ó de las Matas de San Bartolomé (Cabo Yubi). 1913. 1:20,000. [27°50′ N. and 12°55′ W.]. (3) Plano de Rio de Oro. 1913. 1:200,000. [23°55′ - 23°32′ N.; 16°0′ - 15°42′ W.]

Accompany: map (a) separately, maps under (b) facing respectively pp. 141, 143 and 152, "Ensayo de una breve descripción del Sáhara español" by E. d'Almonte, *Bol. Real Soc. Geogr. Madrid*, Vol. 56, 1914, No. 2-3, pp. 129-347.

[Map (a) an important map on a relatively large scale of the Spanish territory on the Atlantic coast of the Sahara, which since its expansion northward from the former colony of Rio de Oro (cf. map listed under "Morocco, (2)," *Bull.*, Vol. 45, 1913, p. 397) is, it seems, to be known as the Spanish Sahara—a very appropriate name. The characteristic physical features of the region are well brought out. The typical sandstone mesas and plateaus are shown by brown shading: distinction is made between granitic (shown in gray) and

quartzite (in brown) outcrops. Dunes are shown in yellow. Drainage is in blue; four kinds of wells are distinguished according to the quantity and the quality of their water. Towns and routes are in black, tribal names in red. On the coast, the limit of the fishing area is shown, as well as the currents. The treatment of the latter, both in the legend on the map and in the text (pp. 164-166), reveals a lack of familiarity with modern oceanographical research. The Canary Current is designated the Gulf Stream—a somewhat infelicitous extension—and the upwelling of cold water on this coast—a well-known phenomenon on western, lee (and therefore desertic) coasts of the continents in mid-latitudes, as in German Southwest Africa, the Atacama district of Chile or in California—is still ascribed to a ''corriente fría polar antárctica.'' The map is doubtless the most complete extant representation of the region.]

EDUCATIONAL

North America-South America-Africa. [Three wall maps:] (1) North America. Modified conic projection. 1:7,250,000. 9 colors. With inset: Continuation of Alaska Peninsula. [Same scale]. (2) South America. Modified orthographic projection. 1:6,336,000. 7 colors. With two insets: (a) Galapagos Isles. Same scale. (b) Panama Canal [Zone]. [1:500,000]. (3) Africa. Modified orthographic projection. 1:8,200,000. 12 colors. With two insets: (a) Delta of the Nile Showing Suez Canal. [1:1,700,000]. (b) New England States. 1:8,200,000. In series: International Series. Constructed and engraved by W. & A. K. Johnston, Limited, Geographers, Engravers & Printers, Edinburgh and London. Authorized American Edition, A. J. Nystrom & Co., Sole U. S. Agents, Chicago.

[Very fair series of political wall maps. Political divisions are shown by surface coloring, reinforced by heavy red or other colored border lines. Relief is shown in brown hachuring. The principal railroads, steamship lines, with time of passage, and cables are shown. The nomenclature is too copious for educational purposes. The maps are lithographic transfers from the original plates and were printed in America.]

North America-South America-Europe. [Three wall maps:] (1) Nordamerika: Physikalische Schulwandkarte in Verbindung mit Prof. Dr. Gustav Leipoldt in Dresden gezeichnet von M. Kuhnert, Realschuloberlehrer in Chemnitz. 1:6,000,000. 7 colors. (2) Physical Wall Map [of] South America (Relief-like Series). Designed by M. Kuhnert and Prof. Gustav Leipoldt. 1:6,000,000. 7 colors. (3) Europa: Physikalische Schulwandkarte in Verbindung mit Prof. Dr. G. Leipoldt in Dresden gezeichnet von M. Kuhnert, Realschuloberlehrer in Chemnitz. 1:3,000,000. 7 colors. (1) and (3) published by A. Müller (Fröbelhaus), Dresden, (2) by Goder-Heimann Co., Chicago.

[These maps are specimens of a series of German physical wall maps imported by A. J. Nystrom and Co. of Chicago. Maps (1) and (3) have nomenclature in German, map (2) is mute. An earlier edition of map (3) was reviewed in the *Bull.*, Vol. 38, 1906, p. 196. The maps differ considerably from the usual type of German wall maps. Relief is represented essentially in two colors, green for the lowlands and gray for the highlands. The representation of the latter resembles a relief model made in wet sand. While the attempt thus to render relief plastic to the uninitiated is praiseworthy, the result is inferior to the customary type of German physical wall maps with their green-buff-brown gamut and shading in brown. There is a certain crudeness and stiffness about the mountains which may be due to the lack of a master hand—for nothing so tests the cartograher's skill as the representation of relief—but we are inclined to believe that it is also due to the method employed. In general conception the maps, to be sure, fulfill the requirements of a wall map, boldness of design and elimination of non-essentials. Judged by American standards they are excellent, judged by German standards, however, they are mediocre. If we are to import school maps, why should we not have the best? Why not select such excellent series as those by Gaebler, Diercke, Haack or Sydow-Habenicht, which represent the very acme of the school cartographer's

art, or why not turn to England, which, in our own language, can supply us with such excellent series as those by Herbertson, Unstead and Taylor or Philip?]

Other Maps Received

EUROPE

Austria-Hungary. Linz an der Donau. 1:10,000. [The City Engineer, Linz, 1913]

[Plans of Vienna]. (1). Der Wald- und Wiesengürtel und die Höhenstrasse der k. k. Reichshaupt u. Residenzstadt Wien. Verfasst vom Stadtbauamte. 1:30,000. 1905. (2). Reliefplan von Wien mit dem Wald- und Wiesengürtel und der Höhenstrasse. 1:56,000. (3). Detail-Darstellung eines Teiles des Wald- u. Wiesen- bezw. Gartengürtels am Laaerberge. 1:2,880. 1905. (4). Plan der k. k. Reichshaupt- und Residenzstadt Wien. 1:25,000. Herausgegeben unter Mitwirkung des Wiener Stadtbauamtes. Gezeichnet von Karl Loos. 1913. (5). Übersicht der Verteilung der Gärten, Wiesen, Waldflächen und anderer unverbaut bleibender Gebiete in den Städten: Paris, Berlin, London und Wien. 1:150,000. [Gift from the City Engineer, Vienna].

Békés Csaba átnézeti térképe. 1:8,000. Készitette és kiadje Békéscsaba, mérnöki hivatala, [1913]. [Gift from the Mayor, Békés Csaba].

Temesvár szab. kir város Térképe és Városbövitésiterve. 1:10,000. [The City Engineer, Temesvár, 1913].

Belgium. Plan général de la ville de Charleroi. 1:7,500. Publié par A. Verwest, Graveur, Bruxelles, [1913]. [Gift from Bureaux de la Mairie, Charleroi].

Louvain. [Gift from Bureaux de la Mairie, Louvain].

Nouveau plan de Malines & ses faubourgs, dressé en 1908. 1:25,000. [Bureaux de la Mairie, Malines], 1908.

Plan de la commune de Seraing. 1:10,000. Dressé par J. Andrien et L. Picalausa. [Bureaux de la Mairie, Seraing], 1905.

British Isles. Plan of the City & Royal Burgh of Aberdeen. 3 in. to 1 mi. (1:21,120). Burgh Surveyor's Office, Aberdeen, 1909.

County Borough of Birkenhead. 6 in. to 1 mi. (1:10,560). Revised 1908-9. Published by the Director General at the Ordnance Survey Office, Southampton. [Gift from Borough Engineer's Office, Birkenhead].

[Bolton]. Reduced from 6-in. Ordnance Survey, by permission of the Board of Agriculture and Fisheries. 5 in. to 1 mi. (1:12,672). Hasler, Watson & Co., Ltd., Bolton, [1913]. [Gift from the City Engineer, Bolton].

Bacon's plan of Brighton and Hove. 9 in. to 1 mi. (1:7,040). G. W. Bacon & Co., Ltd., London, [1913]. [Gift from City Engineer, Brighton].

Robt. J. Cook & Hammond's map of the Borough of Croydon, with portions of Addington & Sanderstead. 6 in. to 1 mi. (1:10,560). Robt. J. Cook & Hammond Co., Westminster, [1913]. [Gift from the City Engineer, Croydon].

Harwood's new map of the County Borough of Derby, taken from the Ordnance Survey, with latest additions. With index to streets. 1:12,000. James Harwood, Derby, [1913]. [Gift from City Engineer, Derby].

Plan of Dundee, revised to date by Jas. Thomson, C. E., City Engineer. 6 in. to 1 mi. (1:10,560). Published by James P. Mathew & Co., Dundee, 1914. [Gift from City Engineer, Dundee].

Plan of Edinburgh, Leith and Portobello, with suburbs, constructed from Ordnance and private surveys. 1:10,570. W. & A. K. Johnston, Ltd., [Edinburgh], 1909-10. [Gift from City Engineer, Edinburgh].

Geo. Gibbons & Co.'s map of Leicester and environs. 6 in. to 1 mi. (1:10,560). Prepared and lithographed by Geo. Gibbons & Co., Leicester, [1913]. [Gift from the City Engineer, Leicester].

Leyton Urban District, Council District, Essex. 1 in. to 700 ft. (1:8,400). [City Engineer, Leyton], 1914.

[Plan of Manchester]. 2 in. to 1 mi. (1:31,680). Printed at the Ord-

nance Survey Office, Southampton, 1912. [Gift from City Surveyor, Manchester].

Plan of County Borough of Middlesbrough. 1 in. to 950 ft. (1:11,400). Borough Engineer & Surveyor, [Middlesbrough], 1913.

Jarrold's map of the rivers and broads of Norfolk and Suffolk. 4 in. to 1 mi. (1:15,840). Jarrold & Sons, Ltd., Norwich, [1913]. [Gift from City Engineer, Norwich]. 1/-.

Map of the City & Council of Norwich. 12 in. to 1 mi. (1:5,280). City Engineer, Norwich, 1909.

Plan of the City of Nottingham [from Nottingham Yearbook]. 4 in. to 1 mi. (1:15,840). [City Engineer, Nottingham], 1914.

City of Nottingham, railway communications [from Nottingham Yearbook]. 4 in. to 1 mi. (1:15,840). [City Engineer, Nottingham], 1914.

County Borough of Oldham. 6 in. to 1 mi. (1:10,560). Borough Surveyor's Office, Oldham, 1914.

Bacon's plan of Plymouth, Devonport, Stonehouse, &c. 6 in. to 1 mi. (1:10,560). G. W. Bacon & Co., Ltd., London, [1913]. [Gift from the City Engineer, Plymouth].

Map of Portsmouth. 6 in. to 1 mi. (1:10,560). Published by W. H. Barrell, Ltd., Portsmouth, [1913]. [Gift from the City Engineer, Portsmouth].

Rhondda Urban District, reduced from 6 in. Ordnanee Survey, 1900 (second edition). 3 in. to 1 mi. (1:21,120). [The City Engineer, Rhondda].

Map of the County Borough of Salford. 6 in. to 1 mi. (1:10,560). The City Engineer, Salford, [1911].

Map of the County Borough of South Shields. 8 in. to 1 mi. (1:7,920). Borough Engineer & Surveyor, South Shields, 1908.

County Borough of Stockport. 3 in. to 1 mi. (1:21,120). Borough Engineer, Stockport, [1913].

Plan of the Borough of Sunderland, by John W. Moncur, Borough Engineer. 3 in. to 1 mi. (1:21,120). [City Engineer, Sunderland], 1910.

Map of the Willesden Urban District. 6 in. to 1 mi. (1:10,560). O. Claude Robson, Engineer to the Council, [Willesden], 1914.

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Portugal. Carta topographica da cidade do Porto, reduzida da que foi mandada levantar na escale de 1:500 por ordem da camara municipal da mesma cidade referida ao anno 1892. Dirigida e levantada por Augusto Gerardo Telles Ferreira. 1:5,000. [6 sheets]. [Gift from the Mayor of Oporto, Portugal].

[Admirable map showing exhaustively the urban and suburban topography of Oporto. That this has been done so clearly, although only in black-and-white, is remarkable.]

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SOME GEOGRAPHIC INFLUENCES OF THE LAKE SUPERIOR IRON ORES

By GEORGE J. MILLER
State Normal School, Mankato, Minn.

No single resource, unless it be coal or soil, is so vital to the economic growth of the modern nation as iron. Iron ore deposits situated like those of the Lake Superior district, of such high grade, in such a limited area, and so easily mined on a large scale, could not fail to affect the whole nation. Their production, utilization, and conservation concern the whole people. This paper treats only a few of these effects. A complete discussion would involve much of the industrial and commercial development of the country, and much of its political history, during the last half century.

The Ore Fields

Location. The Lake Superior ore district consists of five principal ranges: the Marquette and Menominee in Michigan, the Penokee-Gogebic in Michigan and Wisconsin, and the Mesabi and Vermilion in northeastern Minnesota. The latter are 60 to 90 miles northwest of Duluth-Superior and Two Harbors, from which the ore is shipped to lower Lake ports. The Marquette Range is near the city of Marquette, the Menominee Range near Escanaba, and the Penokee-Gogebic Range 25 to 50 miles from Ashland. Thus each range has an adequate outlet by water, a factor of great significance in its development.

The Marquette Range. Iron ore was discovered in Michigan as early as 1830 and on the Marquette Range in 1844. The first mine was located early in 1845, and the first ore was taken from the region that year.[1] Three years later the first iron made in the Lake Superior country was produced from the ores of this mine. The second mine was opened in 1850, and the ore was hauled 16 miles to a new forge at the mouth of the Carp River. All ore was moved on sleighs in winter, as wagon transportation was impossible over the soft ground in summer. The cost of producing blooms under these conditions, and of shipping them to mills in Ohio and Pennsylvania, brought disaster to the early enterprises. "By the time the blooms were laid down in Pittsburg they had actually cost $200 a ton, and the market rate for iron was then $80 a ton."[2] By 1853 the iron companies gave up making iron in the ore region and definitely took up the problem of transporting the ore. In the fall of that year the first shipment of consequence (152 tons) was made, the ore going to Sharon, Pennsylvania. Four vessels moved the ore from Marquette to Sault Ste. Marie, where it was

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1 R. D. Williams: Transportation of Iron Ore on the Great Lakes, *Iron Trade Rev.*, Vol. 48, 1911, p. 545.

2 *ibid.*, p. 546.

portaged around the rapids.[3] The ore proved to be of very high grade, and a demand for more was created.

Progress, however, was slow for a time. The ore deposits were in an unbroken forest, 14 miles from the Lake shore, and without suitable means of transport; they had to be portaged around the Saint Marys Rapids and reloaded; the Lake vessels were few and small; the ore had to be introduced into the market and many of the iron workers were reluctant to experiment, as some had declared the ore useless.

The iron-mining companies did much to hasten the undertaking and the completion of the Sault Canal, which overcame the great barrier to Lake Superior commerce. The canal did not solve the problem at once, however. A greater demand for iron was needed, one that the eastern mines could not meet. This came with the Civil War, and after 1861 the output of the Marquette Range increased rapidly (Fig. 1). It had no competitor in the Lake region until 1877, when it was producing a million tons of ore per year. At no time since 1880 has its output fallen below 1,300,000 tons, and in 1910 it reached 4,392,000 tons.

The ores of this range occur in rocks of middle and upper Huronian age, the former containing the principal deposits. They vary from a soft, hydrated hematite to hard specular ores with some magnetite. The available ores of the district (estimated at 110 million long tons) and those not available at present (estimated at 15.9 billion long tons) far ex-

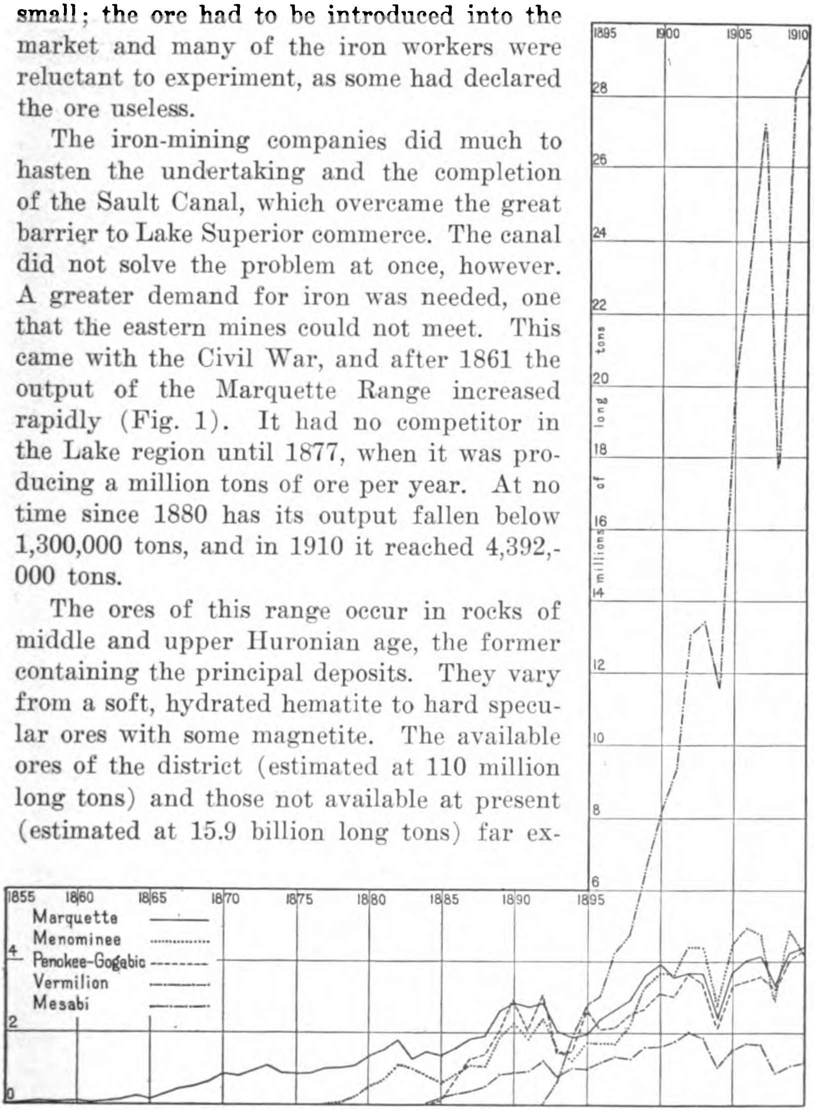

FIG. 1—Lake Superior district iron ore production, by ranges, 1855 to 1910.

[3] R. D. Williams: Transportation of Iron Ore on the Great Lakes, *Iron Trade Rev.*, Vol. 48, 1911, p. 545.

ceed those of any other range except the Mesabi. At the present rate of production its high-grade ores will be exhausted in the next twenty-five years. But before that time its lower grade ores (15 billion long tons) doubtless will have entered the market.

The Menominee Range. Iron ore deposits were known in the Menominee district at least as early as 1867.[4] Lack of transportation facilities and inadequate knowledge of the deposits delayed development until after the Chicago and Northwestern Railroad reached the region in 1871-72. The first shipment of importance was made in 1877, and more than one and a half million tons were mined in the first five years. The sixth year its production exceeded a million tons, an amount which it had taken the Marquette Range more than twenty years to equal. Except for slack years, which affected all ranges, its output has increased rapidly, passing the Marquette Range in 1904 and since falling below it only in 1908 and 1910.

The ore having commercial value at present occurs in the upper Huronian rocks and is confined to the southern part of the district. The ore-bearing rocks are folded complexly. The ores are chiefly gray, finely-banded hematites, with which are associated smaller amounts of flinty block hematite. The high-grade ores of this range are estimated at 80,000,000 tons, and the non-available ore at 7.3 billion tons.

The Penokee-Gogebic Range. The first ore, 1,022 tons, was shipped from the Penokee-Gogebic Range in 1884. The ores occur in upper Huronian rocks and are concentrated in large, irregular bodies. Some of the deposits reach a depth of more than a thousand feet. Most of the ore is a soft, hydrated hematite, but there is an abundance of hard, slaty ore. Only underground methods of mining are used. The high-grade ore of the district found a ready market, and the million-ton mark was exceeded the fourth year. In 1890 and 1892 it produced more than any other Lake Superior range. The Penokee-Gogebic Range has much high-grade ore (estimated at 95,000,000 long tons), while its non-available ores are small (some 3.9 billion long tons) compared with those of the other ranges.

The Vermilion Range. The ores of the Vermilion Range are of lower Huronian age, and are associated with intricately folded and highly metamorphosed rocks. They consist of dense, hard, blue or

[4] A. B. Swineford: History of the Lake Superior Iron District, Its Mines and Furnaces (1871), p. 129.

red hematite. Specular ores are seldom found, but brecciated ores are common. The presence of ore was known in 1850, but little or no effort was made to mine it until 1875. The mines were 70 miles from the Lake and all supplies and machinery had to be packed in; consequently little was shipped until a railroad was completed in 1884. This road reached Lake Superior at Two Harbors, which had been selected as the best place for docks, machine shops, saw mills, and round house. Not until 1892 did the output equal a million tons, and only once has it reached 2,000,000 tons. The failure of the district to attain large production is due not to an inferior quality of ore but to the policy of the owners. They can produce ore on other properties much more cheaply. Explorations in recent years show this range to contain large high-grade reserves.

The Mesabi Range. Iron ore in the Mesabi Range was reported at Gunflint Lake in 1852, but the first ore pit was not made until 1890. Other discoveries of rich ore followed rapidly, and in 1892 29,000 tons were produced. The next year the district produced nearly 2,000,000 tons, and by 1910 the output reached 29,200,000 tons.

These ores are of upper Huronian age, and in most places are covered thickly with drift. When this has been removed, great ore bodies of large horizontal extent, compared with their thickness, are exposed. This ore is a soft, porous, brown, red or blue hematite of high grade, and varies from a finely powdered to a compact mass. These conditions make open-pit mining with steam shovels very profitable, as the ore is loaded directly onto the railroad car in the mine. Conservative estimates give 3.1 billion tons of high-grade ore in the Mesabi Range, and more than 39 billion tons that are not available at present. It is therefore not only the greatest present producer, but, so far as known, has the greatest reserves of any Lake Superior range.

The Cayuna Range. For a number of years iron ore has been known to occur in the Cayuna Range, but its abundance elsewhere has delayed development. The first shipment was made in 1909, marking the advent of a new district. Drillings made in the last three years show the presence of high-grade ore, which may prove to be a very large addition to the Lake ore tonnage.

Ore Production: (a) Growth of Production. Except for occasional periods of depression, the production of each of the Lake Superior ranges has increased constantly. The production of the

Mesabi Range has been phenomenal (Fig. 1). Within four years its annual output exceeded that of any other range. In the nineteen years since its opening it has produced 45.5 per cent. of all the ore ever mined in the Lake region, and more than four-fifths (83.5%) as much as has been mined from all the other ranges. In 1910 its output made 67.2 per cent. of the total from the Lake Superior region, and was nearly seven times that of any other range. When it is remembered that three other ranges produce annually more than any other iron mining district in America, the importance of the Mesabi Range is given still greater emphasis. Its output in 1910 formed 54.8 per cent. of the entire ore production for the United States, and it still contains more than half (52.9%) of all the known iron ore of the country and 69.2 per cent. of all that is available under present conditions. The same year the Lake district supplied 81.5 per cent. of the ore mined in the United States. This region not only dominates the iron and steel situation in America, but produced in 1910 approximately 35 per cent. of the world's ore. Thus it makes the United States the world's greatest iron and steel producer. It will not soon lose its leadership, for it has 94.9 per cent. of all the known ore reserves of the United States and 78.3 per cent. of all the ore available under present mining and market conditions.

(*b*) *Reasons for Growth.* Several factors have caused this rapid development and relative importance of the region. (1) The ore is of high quality. Until recently most steel was made by the Bessemer process (Fig. 10), which demands high-grade, non-phosphorous ores. Much Lake Superior ore met these conditions and, once on the market, the demand for it grew rapidly. (2) Cheap mining methods are possible in most places. The character of the deposits made possible open-pit, steam-shovel mining on the Mesabi and comparatively cheap mining on some of the other ranges. In the open pits of the Mesabi district ore is mined at a cost of about 30 cents per ton, which is probably not equaled anywhere else in the world.[5] (3) Transportation methods by water and rail and mechanical devices for handling the cargoes have been so improved that the handicap of distance between the coke and ore has been nearly overcome. (4) The commercial and industrial development of the country has created an unprecedented market for iron and steel products. (5) The concentration of industries under the man-

[5] "At times the cost of digging ore . . . . may go as low as 6 or 7 cents per ton." Estimates by J. R. Finlay, *Eng. and Min. Journ.*, Vol. 87, 1909, p. 743.

agement of large corporations has made possible the expenditure of great sums in perfecting methods of mining, transportation, manufacture, and in the elimination of waste. While this has meant considerable profits to the corporations, it also has meant rapid development of the iron mines and of the iron and steel industries. No other industry gives employment to so many people and pays so much each year in wages.

Results of Development

Development of Transportation: (a) Railroads. When the first iron deposits were opened, 14 miles from Marquette, there was only an Indian trail leading to them. Some better method of transportation was imperative. In 1856 a plank road was completed from the mine to Lake Superior. It was soon converted into a tramway, using mules for power. The next year the tramway was replaced by the first railroad in the Lake Superior region. This road was designed as an outlet for the Marquette mines and was without competition until 1864. That year another railroad was completed from the mines to Escanaba, and it soon became an important ore carrier. With the opening of the Menominee Range this road secured additional ore traffic by extending branches into that district. When the Gogebic Range was opened in 1884 further stimulus was given to railroad building. The Milwaukee, Lake Shore, and Western extended its tracks to the region that year and to Ashland the year following. Since then each of these mining regions has been covered with a network of railroads. Numerous branches have been built to the many mines, both as outlets for the ore and to serve the return traffic created directly or indirectly by the development of the mining districts. Lumber, coal, and agricultural products have formed important freight items for all these roads, but iron ore gave the first stimulus to growth and continues to be the most important single item.

Before 1884 Minnesota had no railroads north of Duluth, except near the western border. That year the Duluth and Iron Range Railroad was completed from the Vermilion Range to Two Harbors. Progress in railroad building was slow, however, until 1890, when the first ore pit was opened on the Mesabi. News of this rich deposit spread rapidly, and there was a rush of explorers during the next two years. Two roads touched the range. The Duluth and Iron Range crossed at Mesabi on the way to Vermilion and the Duluth and Winnipeg (Great Northern) touched the range at Grand

Rapids, but both were far from the ore center. By 1892, however, the Duluth, Mesabi, and Northern was completed to the Mountain Iron Mine and later extended to Duluth, Biwabik, Virginia, Hibbing (1893), and Eveleth (1894). The Duluth and Iron Range also immediately extended branches to each of these mining points.[6] The financial depression of 1894-96 checked development, but since then the growth has been rapid, until now a closely woven railroad web serves the region. There are three railroads built especially for handling iron ore. They aggregate "over 700 miles, with an equipment of 282 engines, and over 16,700 cars."[7] They have so perfected the system of ore transportation that one road frequently handles more than a million tons a month.[8]

(*b*) *Great Lakes Commerce and Iron Ore:* (*1*) *The Sault Canal.* Before 1845 Lake Superior commerce was largely in furs. The ground scarcely had been broken for copper and iron mining. The rapids of the Saint Marys River prevented through water traffic with the lower Lakes. All ore, machinery, and other supplies had to be portaged around the rapids and reshipped. As the value of the mines became better known the necessity of a canal was realized. The extensive development of the region was impossible without it. In 1850 750,000 acres of land were given to the state by the Federal government for the purpose, and a 12-foot canal was completed in 1855. Its opening marked the birth of a new era. The canal admitted vessels of about 400 tons burden and fixed the size of the first ore carriers. The Civil War supplied a new market for the ore and hastened development in northern Michigan. Canal traffic increased rapidly, and the canal was soon wholly inadequate to meet the growing needs of Lake commerce. Accordingly, it was deepened to 16 feet in 1881, but the improvement scarcely was completed when the necessity of still greater depth was realized, and in 1896 it was deepened to 21 feet and larger locks put in. Although the Canadian government has built a similar canal, both combined would be incapable of handling the commerce of the near future, for at times they cannot handle promptly existing traffic. A new canal 260 to 300 feet in width, and a new lock 1,350 feet long, 80 feet wide and 24.5 feet deep are now in course of construction on the American side, and a fourth lock has been proposed (Fig. 2.). Other improvements are being made along the Saint

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6 Chas. K. Leith: The Mesabi Iron-Bearing District of Minnesota, in *U. S. G. S. Monogr. XLIII* (1903), pp. 28-29.

7 John Birkinbine in *Iron Trade Review*, Vol. 58, 1911, p. 51.

8 Dwight E. Woodbridge in *Eng. and Min. Journ.*, Vol. 79, 1905, p. 557.

Marys River, and when all are completed 21 feet of water will be available at the lowest stage. President Livingston of the Lake Carriers' Association believes the need of the fourth lock "will be apparent before the third is finished" and that "the time is rapidly approaching when every inch of available space to the international line will be needed for locks."[9]

As late as 1845 one horse hauled all the freight that passed between Lake Huron and Lake Superior.[10] When the canal was

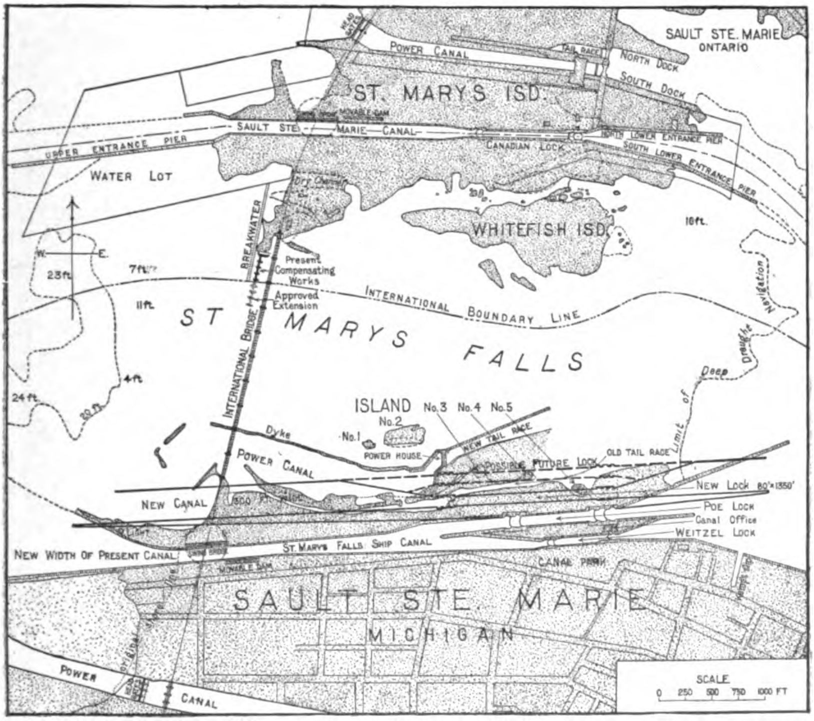

FIG. 2—The Sault Ste. Marie canals, showing new canal and lock now under construction and proposed future lock. Scale, 1:23,000. (Compiled from reports of U. S. Army Engineers and hearings of Commission on Rivers and Harbors, House of Representatives.)

opened ten years later the traffic amounted to 14,503 tons a year. The rate of growth was moderate until after the first enlargement of the canal in 1881 (Fig. 3). This gave added impetus to Lake Superior commerce using the canal, and it increased from 1,567,000 tons in 1881 to 16,239,000 tons in 1896, when the second enlargement was

9 W. Livingston in *The Marine Rev.*, Vol. 41, p. 65.

10 R. D. Williams: Transportation of Iron Ore on the Great Lakes, *Iron Trade Rev.*, Vol. 48, 1911, p. 548.

completed. After 1896 the commerce increased very rapidly, reaching 62,363,000 tons in 1910. This tonnage is said to be greater than that of the combined commerce of New York, London, Liverpool, and Hamburg.[11] It constitutes 71.9 per cent. of the total domestic commerce of the Great Lakes.[12]

(2) *Growth of Lake Commerce and Relation to Iron Ore.* The commerce of the Great Lakes is (1) largely east-bound; (2) chiefly through traffic, especially between Lakes Superior and Erie; (3) mainly between a few ports, and (4) mostly in iron ore, coal, grain and lumber. Since fully seven-eighths of all Lake commerce passes through Lake Superior, the relation of that commerce to this problem is apparent. Iron ore not only constitutes more than two-thirds of Lake Superior commerce but more than half (53.6%) of the total domestic commerce of the Great Lakes. It is evident, therefore, that the commercial prestige of the Great Lakes depends to-day upon the northern iron mines. This ore must meet the coke of Pennsylvania, West Virginia, and other distant states, hence it forms through, bulk freight, making up 88.2 per cent. of all east-bound traffic and 89.4 per cent. of all iron ore transported on the Great Lakes. It has grown from 1,447 tons in 1855 to 41,603,000 tons in

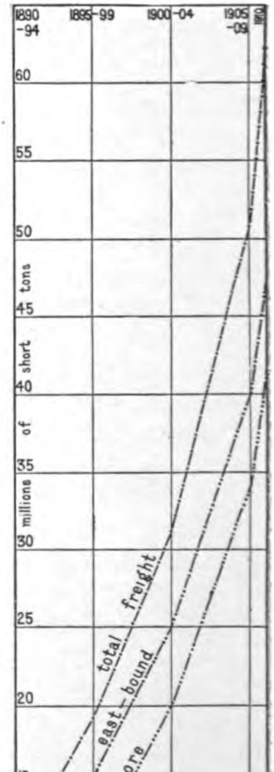
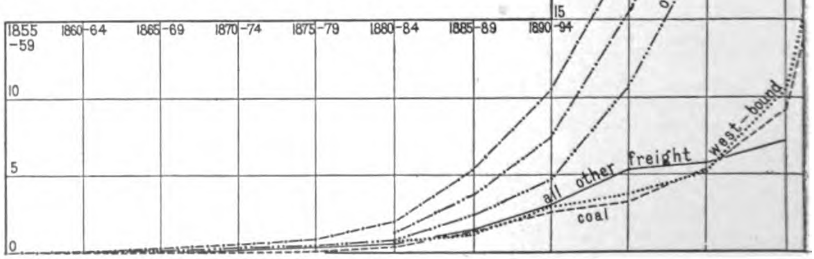

FIG. 3—Freight traffic through St. Marys Falls canals: means of five-year periods.

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[11] R. D. Williams: *op. cit.*, p. 548.

[12] Domestic Lake commerce of 1910 was 86,732,316 short tons. (*Monthly Summary of Comm. and Finance*, Dec. 1910, p. 1012.)

1910 (Fig. 3). Grain, flour, and lumber make up all but one per cent. of the remaining east-bound freight. It is also evident that vessels carrying iron ore, grain, and lumber eastward must return empty unless suitable bulk freight can be had. The iron district and an area extending many miles north, west, and south of it, is without coal; hence this commodity forms 88.7 per cent. of the west-bound traffic and more than one-fifth (21.6%) of all freight passing through the Sault Canal (Fig. 3). This coal also makes up 59.8 per cent. of all domestic coal traffic on the Great Lakes. Since there are many ore boats seeking coal as a return cargo, the Northwest gets its coal cheaper than Chicago, the average rate from Ohio ports to Duluth being 31 cents per ton and to Chicago 41 cents.[13] Although cheap coal has done much to hasten development in northern Minnesota, Wisconsin,and Michigan, thus creating a market for other eastern products, west-bound traffic still forms only one-fourth (24.6%) of Lake Superior commerce. The influence of the iron mines on the development of Great Lakes commerce, therefore, has been a controlling one. They have produced traffic in two commodities—iron ore and coal—which together constitute more than four-fifths (88.3%) of the Sault Canal traffic and more than three-fifths (63.5%) of the total domestic commerce of all the Great Lakes. While it is impossible to measure the growth resulting indirectly from this development, it undoubtedly has contributed no small amount to Lake commerce.

(*3*) *Development of the Carrier.* In the development of Lake commerce the canoe was followed by the sail-boat and the latter by the steamer; wooden vessels gave place to steel vessels, and package freight to bulk freight. If considered individually each has been a revolution, but in the course of development one was essentially the corollary of the other. Lake Superior iron ore has been the primary factor in producing the phenomenal changes in recent years. In 1853 there were three or four schooners of 15 to 20 tons burden and two small steamers on Lake Superior.[14] These vessels, with their cargoes, could be put in the hold of a modern ore boat, with room left for a large cargo.

More than half the bulk freighters built in 1896 for Lake Superior traffic exceeded 2,000 tons net register, yet six years before there was not a single vessel of that tonnage.[15] This change was made possible by the Canadian canal and the Poe lock in the Amer-

[13] *Monthly Summary of Comm. and Finance*, Dec. 1910, p. 1064.
[14] R. D. Williams: *op. cit.*, p. 547.
[15] *ibid.*, p. 553.

ican canal. To-day vessels carrying 6,000 tons are becoming obsolete (Fig. 4), while 10,000 to 12,000 ton boats are increasing rapidly in number. Between 1905 and 1909 twenty-six 13,000 to 14,000 ton freighters entered Lake Superior service. During the past twelve years many 400-foot vessels have been replaced by 400 to 600 footers (Fig. 5). With the completion of the improvements now under construction (p. 888), larger vessels may be expected.

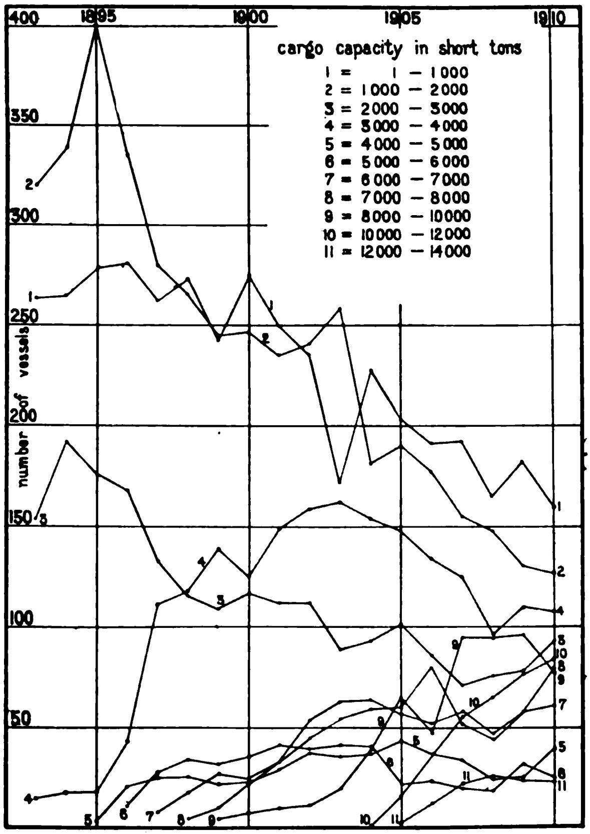

FIG. 4—Change in class of freighters in Lake Superior service on basis of maximum cargo capacity.

In 1910 thirty-eight new freight steamers were put into Lake Superior trade. Fourteen of them do not exceed 258 feet in length, in order to use the Welland Canal; six are between 300 and 500 feet long, and eighteen (42%) are 500 or more feet long and carry from 10,000 to 13,000 short tons of freight in a single cargo.[16] In Janu-

[16] Statistical Report of Lake Commerce Passing Through the Canals at Sault Ste. Marie, 1910, p. 10.

ary, 1911, there were four bulk freighters under construction for American service along the Great Lakes, with a carrying capacity of 460,000 tons a season. Including these, there have been added to the Lake fleet in the past nine years vessels of that class having a combined carrying capacity of 41,548,000 gross tons, an amount nearly equal to the total ore movement of 1909 and 1910. All the bulk freighters building in January, 1911, are for interests identified with iron and steel making.[17] The modern, single-cargo freighter is a direct result of the necessity of transporting a heavy, bulky commodity nearly a thousand miles at a minimum of cost. Bulk freighters exist for carrying grain and lumber, but they serve only a small percentage of the total traffic of the Lakes.

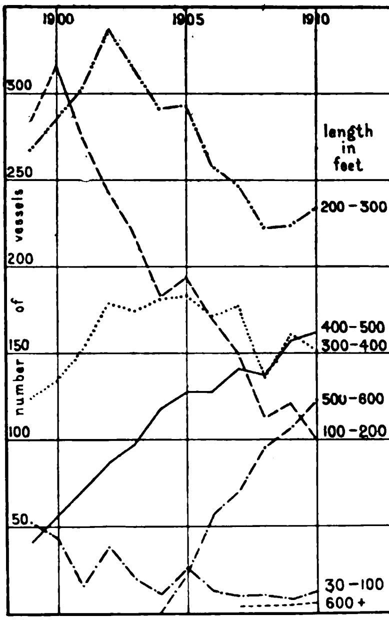

FIG. 5—Change in class of freighters in Lake Superior service on basis of length.

The iron ore traffic has changed not only the size of the carrier, but the carrier itself. Wooden vessels now form only about one-third of the gross tonnage of the Lakes, yet they were dominant a few years since. Steel construction has displaced both iron and wood, and a vessel characteristic of the Lakes has been produced. "They are only square boxes whittled off a little at the ends, and not much forward at that. The reason for this is of course the limited draft of water available and the desire to carry as much as possible on that draft."[18] The machinery is far aft and the pilot house is far forward, leaving all the cargo together and the hatches without a break. The change from sail to steam was accompanied by a change from wood to steel. In 1888 one-third of Lake Superior commerce was carried in sailing vessels; in 1910 only seven per cent. Not a single sailing vessel carrying more than 10,000 tons has ever entered the service.[19]

[17] *Marine Review*, Jan., 1911, p. 1.

[18] W. I. Babcock in *Report of U. S. Commissioner of Corporations on Transportation by Water*, Part I, p. 131.

[19] Statistical Report of Lake Commerce, etc., 1910, p. 10.

(*4*) *Lake Freights.* As the freighters were improved the cost of freight carriage decreased. Since cost of transportation, not mileage, is the true commercial measure of distance, and since steel making affects the whole nation, this change has been of vital importance. In the early 1850's it cost more to get Michigan iron ore

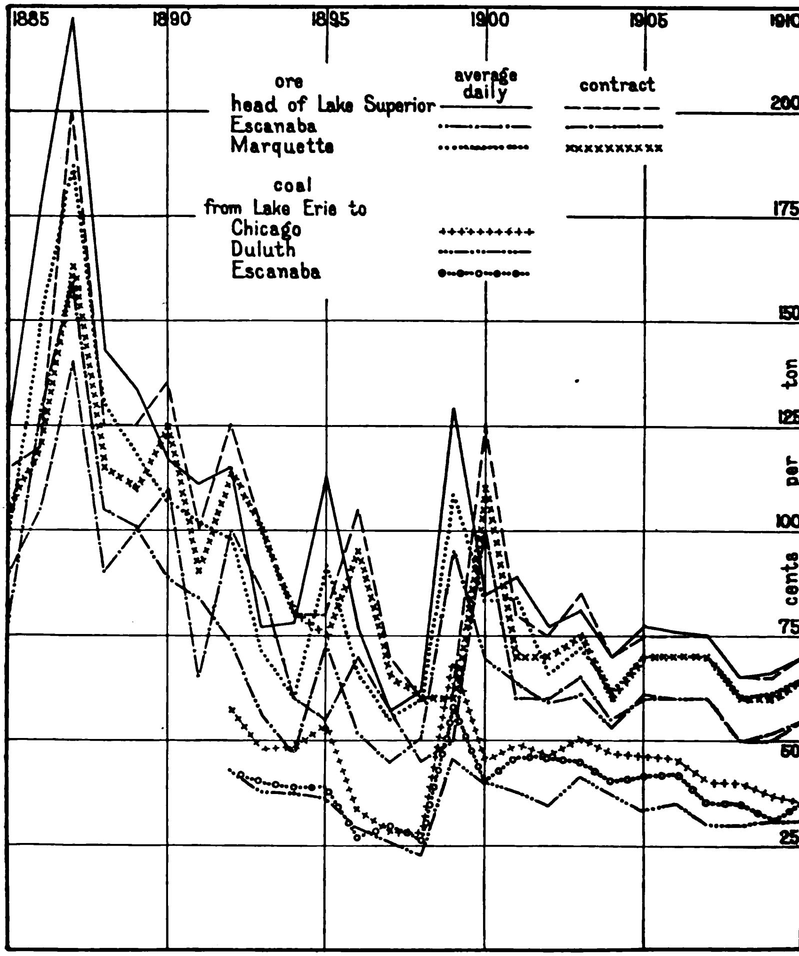

Fig. 6—Average freight rates on iron ore to Ohio ports and on coal from those ports to Chicago, Duluth, and Escanaba.

to the coal than the iron was worth on the market. In 1866 the freight rates to Lake Erie ranged from $3 to $6 per ton, and in 1884 $1.35.[20] The rates since that date are shown graphically in Fig. 6. The change has been characterized by (1) a rapid de-

[20] R. D. Williams: *op. cit.*, p. 552.

cline to 1898, (2) a sharp rise in 1899 and 1900, (3) followed by a decline with little fluctuation. Before 1898 fluctuations were frequent, as steel makers almost always bought ore in the open market, and transportation competition was keen. The next two years witnessed a consolidation and integration of producing and manufacturing companies. The higher efficiency obtained by each of these consolidated companies helped to produce strong competition among them and an increased demand for ore, which resulted in placing ore-carrying contracts early in the season and at high figures (Fig. 6). In 1901 many of these competing consolidations became the United States Steel Corporation, a single subsidiary of which had, in 1909, one hundred ore steamers and barges, carrying one-fourth of the ore moved on the Great Lakes. This is said to be sufficient "to enable it to determine the rates on ore."[21] That there has been some equalizing influence is evident. (Fig. 6).

The ore boats seek coal as a return cargo (page 891), and coal rates fluctuate with those of ore (Fig. 6). Ports at the head of Lake Superior ship most ore, have most returning boats, and secure the lowest coal freights. Duluth receives more than half the coal entering Lake Superior. Lake Michigan ports, except Escanaba, do not ship ore, are not visited by returning ore boats, have poor or no dock facilities for quick handling of coal, and consequently pay higher freights. The water route, steel vessels of great capacity, cheap fuel, coal as a return cargo, the Sault Canal, river and harbor improvements, the growing demand for ore, consolidation of management, and the extensive use of modern machinery, all have contributed toward producing the lowest freight rates in the world for similar service.

Development of Shipping Cities. Two classes of ports—shipping and receiving—have developed with the growth of the iron industry. The former are few; the latter are more numerous and widely distributed. These ports dominate Lake commerce, all but two of the sixteen principal commercial ports belonging to one or the other of these classes. The chief shipping ports are Marquette, Escanaba, Ashland, Two Harbors, and Duluth-Superior (Figs. 7 and 11).

Marquette, the outlet for the Marquette Range, is the oldest ore-shipping port, and for many years was the only one of much importance. Its location was determined by (1) the harbor and (2) proximity to the ore. In 1860 it had a population of only about

[21] Report of U. S. Commissioner of Corporations on the Steel Industry, Part I, 1911, p. 174.

500, but it has become a thriving city with the growth of its ore trade. It installed, in "1858, the first pocket system of ore loading

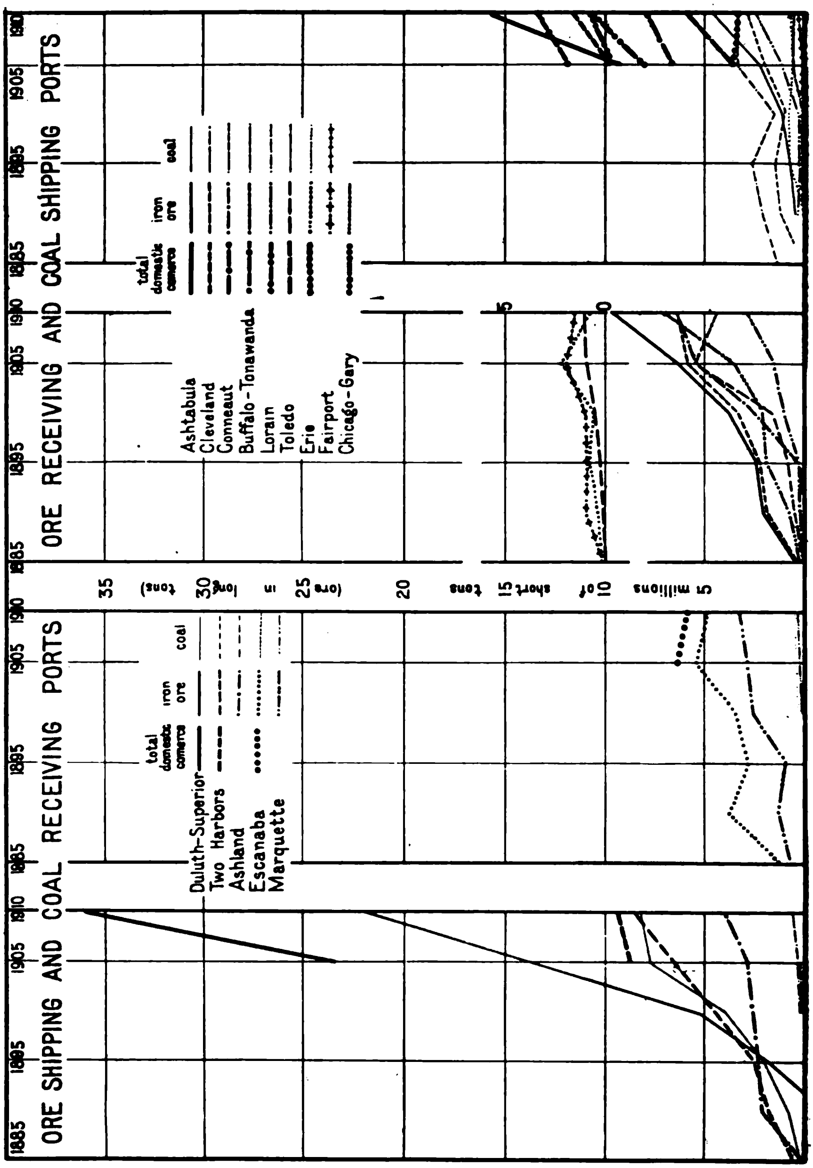

Fig. 7—Commerce of principal iron ore ports.

in the world."[22] The pockets held only a few tons each, but larger and better ones are now in universal use. Its ore shipments have

[22] Report of U. S. Commissioner of Corporations on Water-Borne Traffic, Part II, p. 153.

grown from the few tons of pioneer days to 3,248,000 tons in 1910. Lumber and agricultural interests also have aided in the growth of Marquette.

In 1864 the Chicago and Northwestern Railroad was completed from Negaunee to Escanaba,[23] where an ore dock was built with pockets having a capacity of 20,000 tons, which unload directly into vessels without shoveling. Escanaba has an excellent natural harbor, has a longer season free from ice than Marquette, and is nearer than the Lake Superior ports to the Lake Erie markets, with no canal delays. It therefore became an outlet to the Marquette, Menominee, and Gogebic Ranges, and its shipments soon surpassed those of Marquette, a position which it retains. Although lumbering has been important in the growth of Escanaba, less than one-tenth of its domestic commerce would remain if its ore traffic ceased. This traffic makes it one of the leading Lake ports.

Ashland serves as an outlet for the Penokee-Gogebic Range, especially the Wisconsin portion. Its shipments amounted to 119,000 tons in 1885 and to more than 4,000,000 in 1910. This traffic, like that of Marquette and Escanaba, gives it an abundant supply of cheap coal, which has helped make possible a considerable industrial development.

When the Vermilion Range was opened that portion of the Lake Superior region was a wilderness, and it was necessary to select a harbor and establish a shipping port on the Lake shore. Two Harbors thus came into existence. It was connected with the mines by railroad in 1884, when the first ore was shipped. With the development of the Mesabi Range its ore shipments have grown rapidly, exceeding 8,200,000 tons in 1910. They constitute 99.5 per cent. of its domestic commerce and nearly all of its shipments. Two Harbors has a population of 4,990, an increase of 1,600 in the last ten years. It depends on the ore trade, and its decline would be rapid if that were withdrawn.

Duluth-Superior would have considerable importance without the iron mines. Its strategic position at the head of Lake Superior; its commodious, landlocked harbor of 360 acres, with a minimum depth of 20 feet and 49 miles of frontage; its rich agricultural hinterland, and its water power from Saint Louis Falls are abundant bases for growth. But with iron ore close at hand, cheap coal in large quantity always available, and an increasing market to the south, west, and northwest, its manufacturing advantages are great.

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23 *Collections of Mich. Pioneer and Hist. Soc.*, Vol. 7, p. 169. (Some other writers give this date as 1865.)

Although the lumber and grain businesses have been of much importance in the commercial development of Duluth-Superior, the influence of the mines has been even greater. When the Sault Canal was being built (1854), Duluth-Superior consisted of "one lofty barn-like shed (the hotel), surrounded by an acre of stumps,"[24] and a few hardy pioneers. In 1892 it made its first ore shipment of 4,200 tons and had a population of 45,000. In 1910 it shipped 22,000,000 tons—more than half (51.7%) of all the ore sent by water from all the Lake Superior mines—and its population had increased to 118,800, a gain of 163.5 per cent. in the twenty years. Its ore traffic now forms 67.4 per cent. of its domestic and foreign commerce and more than nine-tenths (91.3%) of its total shipments. Its ore trade is more than half again as large as the total Lake commerce of any other Lake port. Its total commerce equals 58.8 per cent of all that passes the Sault canals, and is equal to about one-sixth of the combined tonnage of all the 240 shipping ports on the coast of the United States.[25] Coal receipts have been a corollary of ore shipments, growing from 592,000 tons in 1885 to 8,420,000 tons, or 62.3 per cent. of all coal entering Lake Superior in 1910. This return trade in cheap coal has been of vital significance in the industrial development of the region.

Development of Receiving Ports: (a) Classification and Importance. The iron ore shipping ports are few in number, but the receiving ports are numerous and widely distributed along the Lakes (Figs. 7 and 11). These ports may be classified as (1) manufacturing and distributing and (2) distributing only. To the first class belong Cleveland, Erie, Buffalo-Tonawanda,[26] Chicago-Gary, Toledo, and Lorain, and to the second class Ashtabula, Conneaut, and Fairport. There are numerous other minor ports belonging to the manufacturing class, the aggregate receipts of which are large, but which need not be considered here. The total domestic commerce of the nine or ten ports named constitutes (1910) nine-tenths (89.6%) of the total domestic commerce of the five Great Lakes. The domestic commerce of the eight Lake Erie ports formed more than nine-tenths (92.4%) of the total for that lake, and their receipts formed nearly half (44%) of the total receipts. The position they occupy in Lake commerce is, therefore, one of great importance. The factors determining their relative importance in the ore and

[24] Laurence Oliphant: Minnesota and the Great West (1855), p. 145.
[25] James O. Curwood: The Great Lakes (1909), p. 119.
[26] For convenience the ports of Buffalo and Tonawanda, of Chicago and Gary are grouped as single ports, as representative of the chief ore ports at the lower ends of Lakes Erie and Michigan.

coal traffic, and hence in Lake commerce, are many and variable. Among the fundamental ones are (1) policies of railroads and interests of those controlling railroads serving these ports, (2) location of new manufacturing plants and the improvement of old ones, and (3) harbor advantages.[27]

(*b*) *Manufacturing and Distributing Ports.* Only the commercial phase of the manufacturing problem will be considered here. Cleveland, Chicago-Gary, Buffalo-Tonawanda are the leaders of this group. Cleveland was at one time the most important receiving port. It is served by more railroads than its rival—Ashtabula—but it has poorer harbor facilities, as boats must dock in the river. It has the advantage, however, of being a large ore consumer, and consequently its receipts have grown rapidly from 589,000 tons in 1885 to 6.3 million tons in 1910. Many things have contributed to the growth of Cleveland, but it was the development of the Lake trade which made it a great industrial center. Only a few years ago this trade "was considered of little importance and a few broken-down steamers were sufficient" to meet requirements.[28] In 1910 the ore trade equaled more than six-tenths of Cleveland's entire domestic Lake commerce and nine-tenths (88.9%) of its total receipts. Cleveland is also an important coal-shipping point, and that commodity forms more than four-fifths of its out-going freight.

Buffalo and Tonawanda occupy strategic positions at the head of Lake Erie, have power for manufacturing equaled by few other American cities, and are certain of a prosperous growth without the iron and steel industry. Yet this district has the largest independent steel-making plant in the United States, and its ore traffic has grown in twenty-five years from 7,160 tons to 4.3 million tons. Some of this ore is sent farther inland, but most of it is consumed at the ports. It enjoys a large trade in grain as well as in coal and iron ore, yet the last two formed more than three-fifths (61%) of its total domestic commerce in 1910, coal making up 70.4 per cent. of the shipments and iron ore 56 per cent. of the receipts. It ships nearly 2.5 million tons more hard coal than all the other Lake ports combined. Until 1905 Lorain was its closest ore-receiving competitor, but, owing to the construction of two new plants and the addition of several stacks to old plants, its ore receipts since then have increased faster than those of any other port (Fig. 7). The commerce of Lorain is almost entirely (97.5%) ore and coal.

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27 Report of U. S. Commissioner of Corporations on Transportation by Water, Part II, p. 158.

28 W. F. Gephart: Transportation and Industrial Development in the Middle West (1909), p. 257.

Erie and Toledo have one and two furnaces, respectively, and are of relatively small importance, yet ore and coal dominate the Lake commerce of both. The ore receipts of the former were 938,000 tons in 1910, and with coal (696,000 tons) constituted three-fourths of its Lake traffic. The ore traffic of the latter formed more than four-fifths (84.3%) of its total receipts. It is the second largest coal-shipping port on the Lakes, that commodity making up 95.3 per cent. of its shipments.

Chicago, Gary, and Milwaukee are the only important ore-receiving ports on Lake Michigan. They are almost exclusively manufacturing points, so far as iron ore is concerned. The Chicago-Gary region occupies a strategic position near the head of the Lake, has excellent land transportation to a rapidly growing market, is near coal and limestone, and its ore receipts have grown from 260,700 tons in 1885 to 6.8 million tons in 1910. Nearly 50 per cent. of this increase has occurred in the last five years. Owing to the methods of railroad companies, legitimate and otherwise, the Lake commerce of this district is not commensurate with its advantages. If its ore traffic were to cease it would lose 56.8 per cent. of its total Lake commerce and would retain less than one-third (30.4%) of its receipts by water. These facts emphasize the importance of the Lake Superior ores to the Chicago-Gary region.

(*c*) *Distributing Ports.* Ashtabula is the largest ore-receiving and coal-shipping port in America, and probably in the world. It receives ore for distribution only, and the growth of its receipts in twenty-five years, from 582,000 tons to 9.6 million tons, is, therefore, all the more remarkable. Ore forms almost all (99.9%) of its receipts and coal more than nine-tenths (93.5%) of its shipments. It has excellent rail connections with the coal and smelting districts of western Pennsylvania and eastern Ohio and harbor facilities unexcelled by any of its competitors. The harbor advantages have given it prestige.[29] Without ore and coal, Ashtabula probably would become an insignificant village.

Conneaut, like Ashtabula, Fairport, and Huron, is a distributing point, and exists largely or wholly because of the ore which comes from the Lake Superior mines. It has good harbor facilities and is the terminus of the Bessemer and Lake Erie Railroad, controlled by the United States Steel Corporation. Since that corporation is the largest shipper of ore, Conneaut rose in ten years from an insignificant place to the third largest receiving port on

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[29] Report of U. S. Commissioner of Corporations on Transportation by Water, Part II, p. 159.

the lakes. In 1895 it received about 200,000 tons, ten years later more than five and one-quarter million tons, and in 1910 6.3 million tons. The last constituted nine-tenths (91.7%) of its total commerce, and nearly all of its receipts.

Fairport has a good harbor, and the Baltimore and Ohio Railroad connects it with the Youngstown-Pittsburg district. Its ore receipts and relatively small coal shipments form three-fourths (75.3%) of its commerce.

Settlement of the Lake Superior Region: (a) Settlement of Area and Increase in Population Due to Mines. Until 1850 the settle-

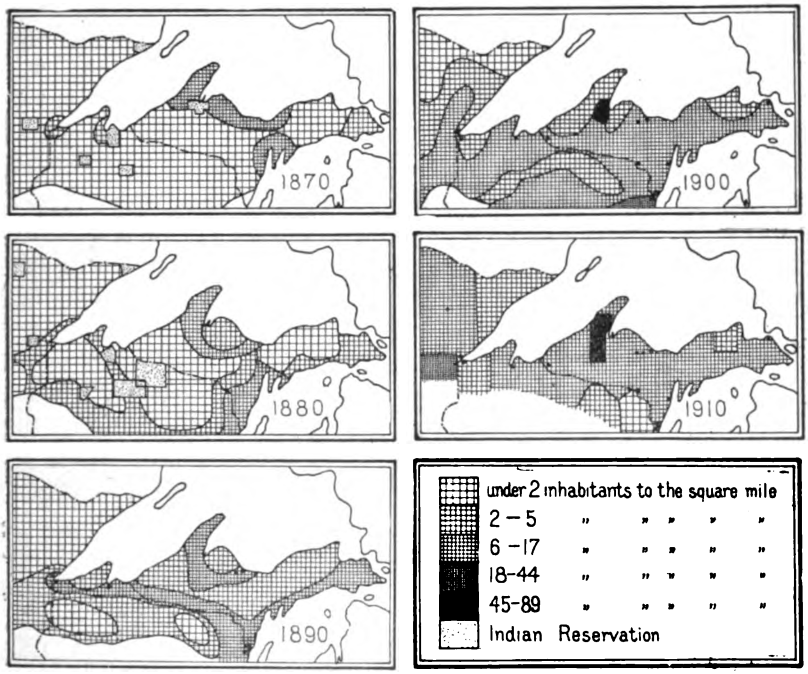

FIG. 8—Distribution of population in the Lake Superior iron mining region, 1870 to 1910.

ment of the Lake Superior region was confined to Sault Ste. Marie, the copper mines in Houghton County, and a few pioneers at Ontonagon and near Ashland. The opening of the Sault Canal in 1855 began a new era, as the bulky iron ore was afforded an outlet. Progress, however, was relatively slow until the Civil War created a demand for iron and stimulated mining. This gave Marquette County the advantage over all others, except Houghton, whose copper mines have been equally important in its settlement and progress. During the thirty years following 1860 the population

of Marquette County increased from 2800 to 39,500, or more than 1300 per cent (Fig. 9). Since 1890 it has had strong competitors, and the loss of territory to other counties has made its growth less conspicuous.

The completion of a railroad to Escanaba in 1864 and the opening of the Menominee Range in 1877 led to rapid settlement in the southern portion of the peninsula (Figs. 8 and 9). This range did not become a steady and important producer until ten years later (Fig. 1), but acquired a population of about 5,000 by 1880, which more than doubled by 1890, and increased more than 500 per cent. by 1900 (Fig. 9).

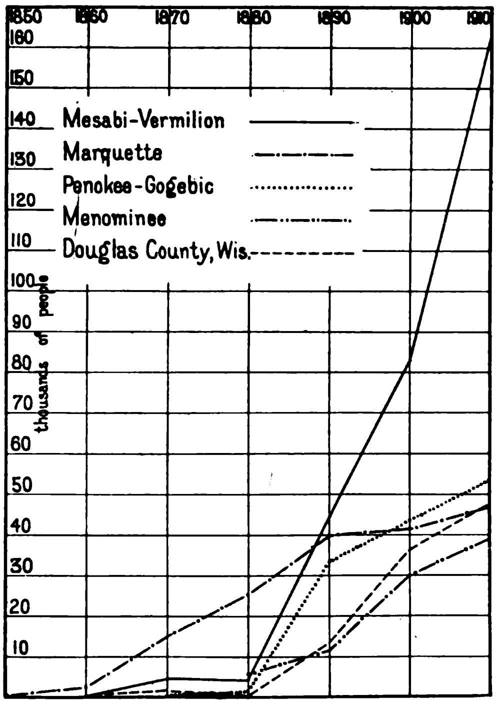

Fig. 9—Growth of population in Lake Superior district by iron range counties, 1850 to 1910.

The Penokee-Gogebic district was essentially a wilderness until the first mine was opened in 1884 (Fig. 1). Four years before its population did not exceed 1,600. Six years later (1890) it had increased more than twenty-two times (2031.4%), and it has had an average annual growth of 1,000 people ever since.

The Mesabi-Vermilion region has been settled with great rapidity (Fig. 9). By 1880 about 4,500 people had been attracted to the head of the Lake and were settled on St. Louis Bay and along the St. Louis River, more than half of them being in Duluth. Carlton County and the adjoining portion of Wisconsin had less than 2,000 more. The back country was untouched except by trappers and explorers, but the opening of the Vermilion Range in 1884 and the great Mesabi deposits in 1892 induced a phenomenal growth and checked the settlement of the other ore districts (Fig. 9, 1890). By 1890 the population of the Mesabi-Vermilion region had increased to nearly ten times that of

1880; by 1900, 1741.1 per cent., and by 1910 nearly 30 times, or 3525 per cent. Douglas County, Wisconsin, might be included with this district, since its growth is due to the development of the Mesabi-Vermilion ranges, and since it contains Superior, one of the largest ore-shipping and coal-receiving ports on the Lake. Just before mining operations began the population of the county was about 650 (Fig. 9), but since then it has increased more than seventy times, more than 85 per cent. of which is in the city of Superior.

Duluth and Superior lead all the other Lake Superior ore centers in their growth, diversified interests and possibilities. Nearly all the industries of these cities are based on things other than iron and steel. Lack of coal not dependent upon returning ore boats and distance from market have been serious handicaps to the economical utilization of their greatest resource—iron ore. However, the rapid development of a market in the northwest and the opportunity to convert cheap return-cargo coal into coke in the modern retort oven and have the by-products share, if not pay the entire cost, have encouraged the building of a large steel plant at Duluth. More than 1.7 million dollars were expended in construction during 1910, and further work is in progress. When completed, the plant will include "two blast furnaces, seven open-hearth steel, and one 10-inch blooming mill, one 28-inch and 18-inch rail and bar mill, 16-, 12-, and 8- merchant mill,"[30] and ninety by-product coke ovens, together with power plants, pumping stations, machine shops, etc.

(*b*) *Two Classes of Towns Developed.* Aside from the rural communities and the many small, unincorporated villages, two distinct classes of towns and cities have grown up during this rapid settlement, viz., mining and shipping towns. A cluster of houses and stores soon followed the opening of mines, and upon the latter the prosperity of the village depended. To this group belong such places as Hibbing, Virginia, Ely, Tower, Missabi, Ironwood (containing nearly half the population of the county), Bessemer, Iron Mountain, Ishpeming, and Negaunee. Some of these have developed related local industries and are thriving little cities. In the last ten years six new towns were incorporated in the Mesabi-Vermilion region, with a total population of 12,699. To the second class belong Marquette, Escanaba, Ashland, Two Harbors, and Duluth-Superior, which have been discussed.

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[30] W. R. Ingalls: Mineral Industry (1910), p. 380.

Lake Superior Ores and the Steel Industry.

Relation of Superior Ores to the Steel Industry. Previous to 1860 Lake Superior mines furnished less than three per cent. of the iron ore produced in the United States. New York, New Jersey, Pennsylvania, and Ohio were the leading iron producers, and in 1880 they supplied three-fifths (59.5%) of the total. Four years later the estimated ore consumption of the United States was twice the production of the nine leading iron ore districts, showing the widespread use of local ores by the blast furnaces.[31] Concentration in iron manufacturing, high-grade Superior ores, and cheap Lake

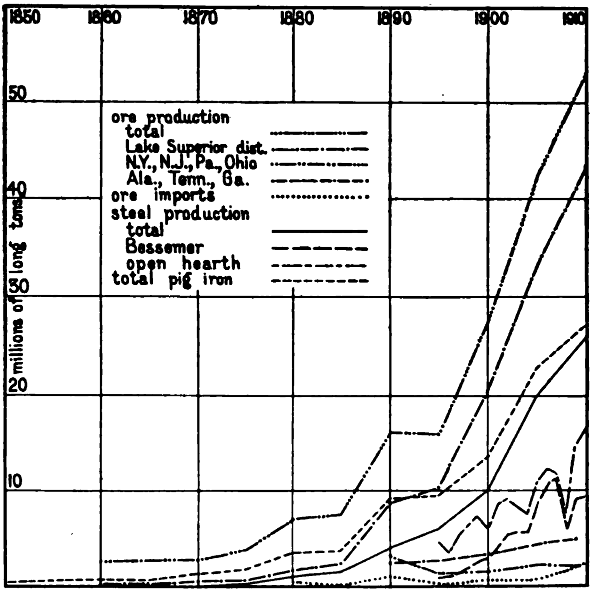

FIG. 10—Iron ore and steel production of the United States.

transportation had not become of sufficient importance to close the small mines serving local markets, many of which have been abandoned since. In 1885 the price of pig iron and steel rails fell to \$18 and \$28.50 respectively (Fig. 12). The industry now ceased to be local and "followed the line of least cost in bringing together the raw materials of manufacture, the principal one of which was iron ore."[32] The value of Superior ores was unquestioned, and by 1890 they formed 55.7 per cent. of the total iron ore product

[31] Iron and Steel Trade of the United States, in *Monthly Summary of Comm. and Finance*, Aug., 1900, p. 206.

[32] *ibid.*, p. 207.

of the United States, and in 1910 81.5 per cent. At the same time the combined output of New York, Pennsylvania, New Jersey, and Ohio declined from 20.4 per cent. of the total to 4.5 per cent., and that of Alabama, Georgia, and Tennessee from 16.3 per cent. to 10.3 per cent (Fig. 10).

Destination of Lake Superior Ores. Only a small quantity of Lake ores is consumed in local blast furnaces, and since they form more than four-fifths of the total production of the country, have

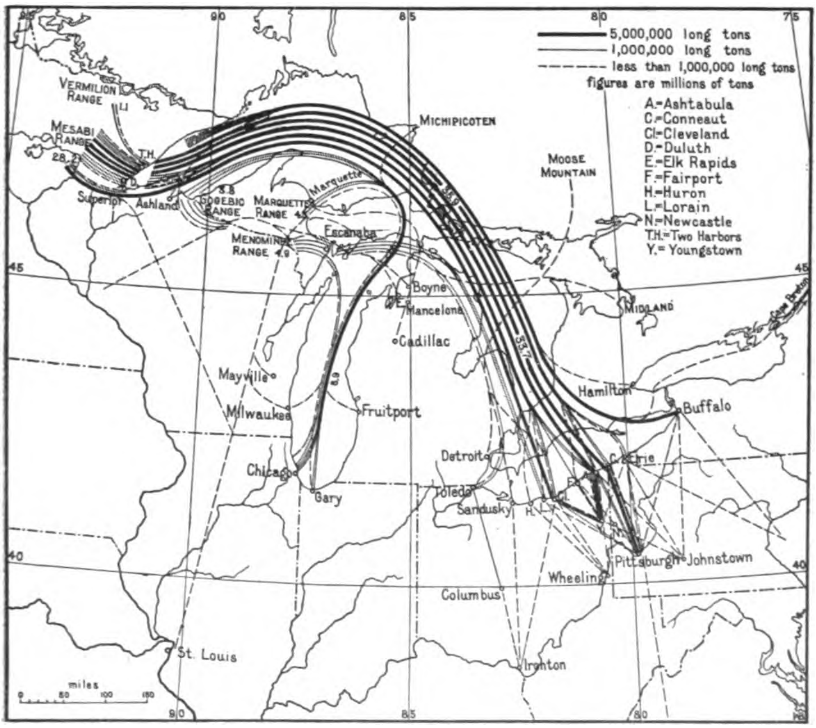

FIG. 11—Destination of iron ores of the Lake Superior region, 1909. (After Birkinbine.) Scale, 1:14,500,000.

cheap Lake transportation, and are handled by the best appliances for loading and unloading from car to vessel, and vice versa, they can be carried great distances (Fig. 11). After passing the Sault Canal about one-seventh of the ore enters Lake Michigan, and nearly all the balance, or approximately 30,000,000 long tons, goes to Lake Erie ports. From these ports most of it is carried to the Youngstown-Pittsburg district. Millions of tons are carried several hundred miles further, however, to eastern Pennslyvania, Virginia,

and Ohio River points, and for special purposes to New England. In addition to water-borne ore, considerable quantities are shipped by rail to furnaces within convenient distances from the mines and to points to which an all-rail haul is more economical than breaking bulk from vessels. Such points are St. Louis, Missouri, and Mayville, Wisconsin (Fig. 11).

Influence in Locating Steel Plants and Allied Industries: (a) Movement to Pittsburg District. The production of iron and steel may be divided into three quite distinct periods on the basis of fuel used, viz., charcoal, anthracite, and coke. Previous to 1855 charcoal was dominant, and furnaces were scattered widely to meet local needs, as in the case of the old saw and grist mills. Between 1855 and 1875 anthracite led. Since a small area in northeastern Pennsylvania had all the fuel, was able to make large quantities of iron, and was near the New York and Philadelphia markets, the first opportunity for leadership in the American iron industry was offered and the first great producing center was established here. In 1870 half of all the pig iron was made with anthracite, but by 1910 this had declined to 2.4 per cent.

By 1875 the greater efficiency in this industry of bituminous coal and coke had been demonstrated. The most important supply of coal and coke lay west of the Appalachians, as did the iron ore and limestone, hence before 1880 the industry had shifted to western Pennsylvania. The introduction of the Bessemer process led to rapid development, and by 1880 the best local ores had been used. Nearness to Lake Erie and cheap Lake transportation made it impossible for the lean ores of western Pennsylvania to compete with the high-grade ores from Lake Superior, hence by 1883 western Pennsylvania produced more pig iron than any other district in the United States.[33] Pittsburg could not avoid becoming an iron and steel center. It commanded Lake ores and coke from nearby centers, had good transportation facilities by water and rail, natural gas, an established eastern market, a rapidly growing interior market, and a local market produced by the growth of allied industries. For almost a half century these advantages have made Pennsylvania the leading iron and steel-making state. In 1910 Allegheny County alone made 19.5 per cent. of the pig iron product of the country; 27.3 per cent. of all steel ingots and castings; 41.9 per cent. of the total structural shapes; 27 per cent. of the country's plates and sheets; and 26.2 per cent. of the rolled iron and steel

[33] James M. Swank: Manufacture of Iron in All Ages, p. 231.

of the United States. Without the Lake Superior ores its leadership would be lost at once.

(*b*) *Movement to Lake Shores.* That the Pittsburg district is destined to lose its relative position seems certain. In 1890 Allegheny County made 14.5 per cent. of the pig iron product of the

PIG IRON PRODUCTION IN PERCENTAGE OF TOTAL FOR THE UNITED STATES[34]

Year	Alabama district	Atlantic coast	Lake shores	Allegheny Co., Pa.	All others
1890........	12.1	22.6	14.4	14.5	36.4
1895........	12.0	....	15.7	....	....
1899........	10.6	13.0	15.9	23.9	36.6
1901........	10.0	13.3	16.8	23.2	36.7
1902........	10.7	11.6	16.8	23.9	37.0
1903........	11.4	12.4	17.1	23.4	35.7
1904........	11.1	11.0	18.0	26.6	33.3
1905........	8.8	10.8	19.7	23.5	37.2
1906........	8.6	11.1	20.5	22.5	37.3
1907........	8.3	11.3	22.4	21.1	36.9
1908........	10.7	9.9	24.9	24.5	30.0
1909........	....	....	....	21.3	....
1910........	....	....	....	19.5	....

United States, and the Lake shores made 14.4 per cent. In the following eighteen years the product of Allegheny County furnaces increased irregularly to 24.5 per cent., but two years later (1910) it declined to 19.5 per cent. During the same time the Lake shore product increased without fluctuation to 24.9 per cent. (1908), thereby becoming the leader. Further evidence of this lakeward tendency is found in the selection of Buffalo by the Lackawanna Iron and Steel Company for its new works.[35]

Obviously there are certain fundamental factors operating to determine the location of iron and steel works. (1) In general two tons of ore are required for one ton of iron, and two to two and one-half tons of ore to one ton of coke. This ratio is increasing with the use of leaner ores. This would seem to indicate that steel plants should be near the iron ore mines. However, present means of shipment and handling make ore transport cheap, and it deteriorates very little in handling; hence the ore can travel much farther than the fuel. (2) The fuel, mostly coal and coke, is less easy to transport than ore, for it is more bulky and deteriorates with handling. It is, however, absolutely necessary in ore reduc-

[34] John J. Porter in *Manufacturers' Record*, Oct. 7, 1909, p. 59.
[35] Andrew Carnegie: The Empire of Business, p. 238.

tion and steel making; hence plants are located where there is abundant mineral fuel at a convenient distance. (3) Labor is mobile and at present goes where work is offered. (4) An easily accessible market, where the product can be converted rapidly and regularly into money, is vital, and plants remote from a market are seldom successful.

Several points along the shores of the Great Lakes possess all the advantages. More than three-fourths of all the known available iron ores of the United States and nearly all the highest grade ore is directly tributary to these ports at a transportation cost of 50 to 70 cents per gross ton.

The fuel problem is even more promising. About two and one-half tons of ore can be secured at a freight rate slightly, if any, higher than that for the necessary one ton of coke. But the process of making coke is changing, and for this reason coal instead of coke will be shipped to the steel-making Lake ports. New retort ovens are being installed in connection with the steel plants, the gas from which will supply power and fuel for the plants themselves, while the sale of surplus gas and other by-products will more than pay the coal freight. In some cases at least Indiana and Illinois coal will be used, thus eliminating the long haul from Connelsville and West Virginia. Retort ovens with by-product recovery attachments are now in operation in Milwaukee, Chicago, Gary, Buffalo, Cleveland, and other cities.

A local supply of labor is no longer important. This is shown clearly by the transforming, within four years, of a desolate sand dune area to a thriving city of over 30,000 at Gary, Indiana.

The Lake ports engaged in the iron and steel industry have excellent markets in the large and rapidly developing Mississippi Basin to supplement the demand created near their steel plants by allied industries and building trades. They also have the advantage of both water and rail transportation direct from the steel mills. This, for example, enables the products of the South Chicago and Gary plants to reach its foreign market entirely by the water route, and at the same time affords it rapid rail transportation to the central part of the country.

(c) *Allied Industries and City Development.* Since iron is fundamental to all manufacturing industry, the location and success of large steel plants are of vital significance in city growth. Iron and steel enters so completely into other industries "that prosperity in any of them increases the demand for iron entering as material into

their products, and at the same time also increases the demand for machinery and tools for working up that material into finished products.''[36] Because of this intimate relation, the iron and steel industry forms an accurate barometer of the general condition of all industrial business. The building of a large steel plant immediately attracts other manufacturing enterprises dependent upon a cheap and regular supply of raw steel and pig. This means the concentration of thousands of laborers, the development of mercantile pursuits to supply the market thus created, and hence the rapid growth of cities. Lake Superior ores are and for many years will be a chief factor in the growth of many cities. Without these ores Pittsburg would be a much less thriving manufacturing city. Youngstown and neighboring cities, Wheeling, Steubenville, Johnstown, and other important places ''would support but a small fraction of their present industries and population, notwithstanding the advantages of local fuel or river transportation which they have.''[37] Much of the advancement of Buffalo, Duluth, Ashland, Marquette, Escanaba, Chicago, Milwaukee, Cleveland, Toledo, and Detroit is due to the same powerful agency, while Gary, Lorain, Ashtabula, Conneaut, and Tonawanda are creations of it.[37]

A Factor in Formation of Large Corporations. Ever since the Lake Superior ore became dominant in the iron and steel business there has been an invitation to consolidation. The chief factors favoring this were (1) the localization of more than nine-tenths of the known iron ore reserves of the United States within a limited area; (2) the possibility of controlling freight rates on ore from mine to smelter, and on coke to the smelter; (3) the localization of the best coking coal in the Pennsylvania-West Virginia-Kentucky district; and (4) the unparalleled opportunity for stock speculation.

Previous to 1898 the steel industry was characterized by active competition and very slight integration between the producing of the raw material and the finished product. By the beginning of 1900 the business had been revolutionized. One consolidation had followed another until less than a dozen controlled the business. One group of consolidations controlled the manufacture of crude and semi-finished steel for the general trade, ''or of the heavier finished steel products, such as steel rails, beams, plates, and bars'';[38] the other group controlled the tin plate, wire, wire nail, wrought and seamless tubing, steel sheet, and the heavy steel bridge construction

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36 Twelfth Census: Manufactures, Vol 1, p. cxlix.

37 John Birkinbine in *Iron Trade Review*, Vol. 48, 1911, pp. 51-52.

38 Report of U. S. Commissioner of Corporations on the Steel Industry (1911), Part I, p. 4.

industries. These individual consolidations were, or soon became, completely integrated units, that is, their operations extended from the ore mine to the finished products. It became apparent that their life depended upon the control of large ore reserves, hence the larger proportion of the Lake Superior ores were soon secured "by less than a dozen interests, chiefly steel-making concerns. The most desirable coking coal fields of the East had been secured, largely by the same steel making interests, with almost equal rapidity."[39] The *immediate* causes producing these consolidations were (1) a desire to restrict the competition which previously had characterized the industry; (2) a desire to bring about complete integration between raw materials, transportation, and manufacturing processes, thus introducing great economies; and (3) a desire to create a great amount of inflated securities.[40] This was accomplished by issuing common stock as bonus for each share of stock turned in to the consolidation. For example, each $100 share of the Consolidated Steel and Wire Company grew to $490 by the time that concern, by a series of consolidations, became a part of the American Steel and Wire Company of New Jersey. This amount was increased further when the latter company became a part of the United States Steel Corporation.[41]

Each of the consolidations was essentially independent of the other, integration brought the economies expected, and each was better able than ever to meet competition. Essential monopoly was secured in some branches of the industry, but competition was not destroyed, and threatened to become more severe than ever. Continued strong competition between these powerful groups would mean overproduction and serious industrial disturbance. It was believed that the situation would be controlled completely if these great groups could be united with each other and with the Lake Superior Consolidated Iron Mines Company, which controlled several hundred million tons of high-grade ore, a railroad to the shipping ports, and a fleet of ore vessels. The opportunity to eliminate competition, secure integration, and inflate steel stocks was unprecedented, and in 1901 the United States Steel Corporation was formed.

By this combination the corporation acquired about 700,000,000 tons of Lake Superior ore, more than 50,000 acres of coking coal lands, several railroads with more than 1,000 miles of track, a fleet of 112 ore vessels, steel works with a yearly capacity of more

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[39] Report of U. S. Commissioner of Corporations on the Steel Industry (1911), Part I, p. 5.
[40] *ibid.*, p. 5. [41] *ibid.*, p. 6.

than 9,400,000 tons of crude steel and more than 7,700,000 tons of finished rolled steel products,[42] about two-thirds of the steel ingots production, one-half to four-fifths of the rolled steel products, and about 58 per cent. of the steel-making pig-iron production of the United States.[43] Since then it has made extensive additions to its holdings, and in 1910 it controlled about 1.6 billion tons of ore, or more than 75 per cent. of the commercially available Lake ore reserves.[44] It is because of these ore holdings and "the peculiar advantages enjoyed in the transportation of ore that the Steel Corporation occupies an extremely commanding position in the iron and steel industry. Indeed, in so far as the Steel Corporation's position in the entire iron and steel industry is of monopolistic character it is chiefly through its control of ore holdings and the transportation of ore."[45]

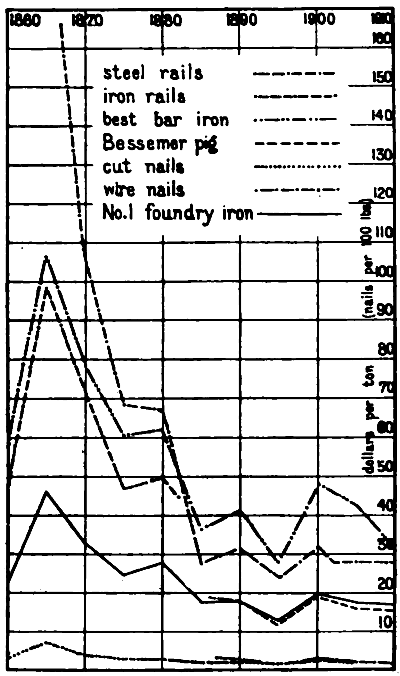

Fig. 12--Prices of selected iron and steel products for fifty years, 1860 to 1910.

Relation to Prices of Steel Products. During the past half century there has been much fluctuation in the prices of leading iron products (Fig. 12). The Civil War, together with depreciated money values, active competition among both ore producers and manufacturers, and periods of business depression and activity, have been contributing causes. During the same period there has been a substantial absolute decline produced by the Bessemer and open-hearth process, improvements in blast furnaces, manufacturing processes, ore transportation and handling methods, consolidation and integration, and the use of Lake ores. As has been shown, an ore supply is fundamental to the steel industry, and its cost is equally fundamental in determining the manufacturing cost of iron and steel products. Monopoly in some branches determines the sell-

[42] Report of U. S. Commissioner of Corporations on the Steel Industry (1911), Part I, p. 13.
[43] *ibid.*, p. 12. [44] *ibid.*, p. 58. [45] *ibid.*, p. 60.

ing price. True ore values are determined primarily by the estimate that the consumer places on the resulting manufactured products of iron and steel. Until recently Bessemer steel dominated the business, and ore of almost perfect Bessemer grade was available in large quantities and at small cost in the Michigan and Minnesota mines. It is natural, therefore, that these ores should dominate the market and constitute the largest single factor in fixing the low price of ore and hence in cheapening the cost of manufacture and in lessening the price to the ultimate consumer.

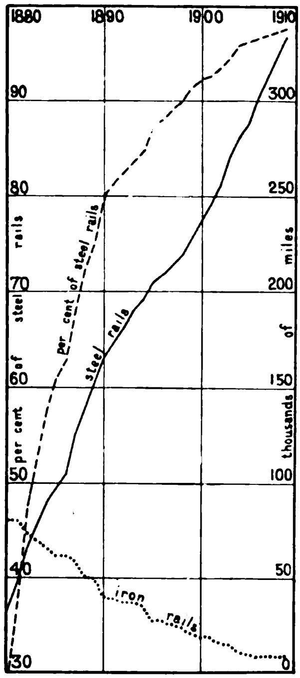

FIG. 13—Change in iron and steel railway mileage in the United States, 1880 to 1909.

Relation to Railway Expansion: (a) Lake Ores Basic Factor in Change to Steel Rails. The first Bessemer steel rails rolled in the United States were produced in Chicago in 1865. The market price of steel rails three years later was $166 per ton (Fig. 12). This price declined rapidly to $67.52 in 1880. Their value was realized, but they cost more than iron rails, and in 1880 the latter still formed more than four-fifths (81%) of the total railway mileage (Fig. 13). In less than three years, however, the price of steel rails fell below that for iron rails, and the latter ceased to be quoted (1882) on the market. From that time on iron railway mileage decreased, and steel mileage increased rapidly, forming 97.7 per cent. of the total mileage in 1909 (Fig. 13). This change was due to (1) the Bessemer process, (2) the supply of suitable Lake ores, and (3) the superiority of steel rails. Without either it would have been slow and costly. In 1907 93 per cent. of the rails produced were Bessemer, but since then open-hearth rails have increased to more than 47 per cent (1910) of the yearly output.[46] This proportion will increase as better rails are secured and as poorer ores can be used in the open-hearth process.

(*b*) *Railway Efficiency Increased.* The substitution of steel for iron rails was "the primary factor in the improvement of American

[46] W. R. Ingalls in *Mining Industry*, Vol. 19, 1910, p. 366.

railroad service,'' and but for this change ''none of the other'' improvements ''would have been possible. This increase in the use and size of steel rails . . . has induced the other improvements.''[47] Since steel rails are eight to fifteen times more durable and much stronger than iron rails, the size of locomotives, cars, and train loads has been increased greatly. At the close of the Civil War the average engine weighed 90,000 pounds; by 1900 it weighed 250,000 pounds. Its average freight-carrying efficiency increased 50 per cent. in the five years from 1894 to 1899.[48] At the beginning of the same period (close of the Civil War) the average freight car carried seven and one-half tons; in 1900 it carried fifty tons. In the latter year a car of forty-ton capacity could be constructed weighing only 3,000 pounds more than a thirty-ton car ''and cost hardly $50 more.''[48]

(*c*) *Spread of Population and Industrial Development Encouraged.* Rapid railroad growth has been fundamental in the expansion of population and in industrial development. Under our free-land policy population spread westward with extraordinary rapidity, and for a time it was essentially a race between the westward extension of settlement and the railroad, the latter endeavoring to serve the former. Cheap and high grade Lake ores supplied the steel essential to this expansion. The old iron equipment was wholly inadequate in either strength or endurance. It seems certain that the settlement and economic development of the West and of much of the central plains would have been delayed but for these ores and their proximity to the Great Lakes.

Railroads opened up the fertile lands of the West and Northwest and were primary agencies in the successive westward movement of the wheat region. They made it possible for these new lands to compete with the older grain districts of the eastern states, of Europe, and of Asia. ''The immense agricultural crops of the country . . . never could have been moved to either home or foreign markets if iron rails had continued in use; the attempt to transport them . . . would have so worn out the rails that the tracks would have been continually torn up for repairs,'' resulting in constant interruption of traffic. Dependence upon foreign steel rails would have so increased the transportation cost ''that it would not have been profitable to grow these immense crops; indeed the prices of foreign rails would have been so high that few railroads would have been built in the western states and territories, and the marvelous

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47 **Final Report of the U. S. Industrial Commission, 1902, p. 291.**
48 ***ibid.*, p. 293.**

development of that section could not have taken place . . . But for our cheap home-made steel rails, flour and meat, lumber and coal and other heavy products could not have been cheaply distributed to consumers; the necessaries of life would have been largely enhanced in price through the high cost of transportation, and the whole country would have had a much less rapid growth than it has experienced."[49]

Relation of Lake Ores to Position of United States in World's Iron and Steel Business

Lake ores not only hastened the development of the interior United States and aided in determining the character of this development, but were fundamental in making America the world's greatest iron and steel producer. Forty years ago (1870) the United Kingdom led all other countries, producing half of the world's pig iron and more than two-fifths of the steel. The United States was a poor second, making only 13.8 per cent. and 9.6 per cent. respectively. Both Germany and France were larger producers of steel than the United States. During the eighties Lake ores and the Bessemer process became established in the American steel industry, and by 1890 the United States surpassed all it rivals (Fig. 14). That year the United States produced more than one-third of the world's pig iron and steel, the United Kingdom about three-tenths, and Germany about four twenty-fifths. Since then the development of the basic process has made available Germany's extensive ore resources, and by 1902 its output exceeded that of the United Kingdom. Germany's growth in the past twenty years has been vigorous, and in 1910 it made about 23 per cent. of the world's pig iron and steel. This left the position of the United Kingdom about equal to that of Germany in 1890. But during the same time the growth of the United States was unprecedented. Its output of pig iron in 1910 exceeded, by 6,000 tons, that of the world two decades before, and its steel production was nearly two and one-fourth times larger. All its competitors in the race for the world's supremacy were left hopelessly behind. It produced in 1910 42 per cent. of the world's pig iron and more than 45 per cent. of the steel, and the United States, United Kingdom, and Germany combined yielded four-fifths of the total. It is true that European countries are small compared with America, but their iron is distributed much less widely, and in international relations it is the individual nation

[49] James M. Swank: Manufacture of Iron in All Ages (1892), p. 416.

and not the continent that is considered. Furthermore, since iron is such an important factor in the ecomonic development and possibilities of any nation the comparison is legitimate.

Aside from our rich ores and the Bessemer and open-hearth processes other things have contributed to our position. Chief among these should be mentioned (1) our abundant supply of cheap coke and limestone; (2) machine methods from mine to consumer;

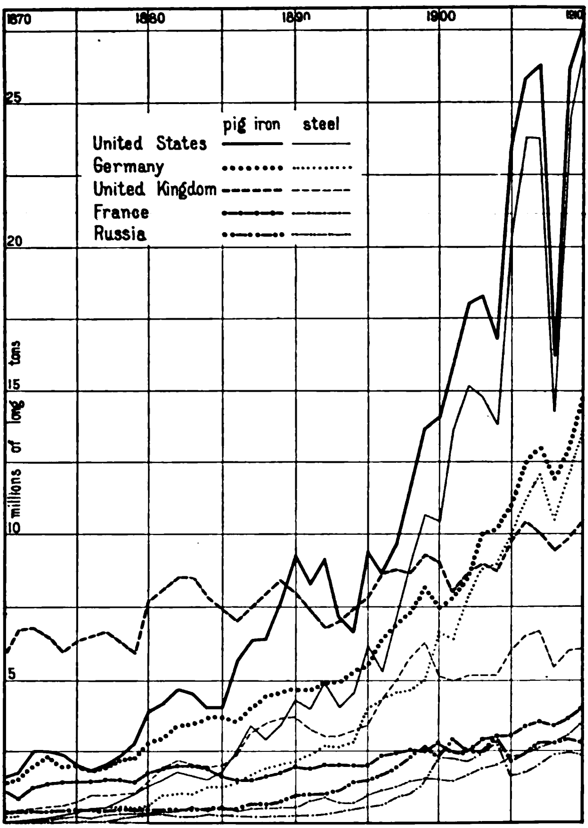

FIG. 14—World's production of pig iron and steel.

(3) large capacity plants under a highly economic system of integration, giving the producer continuous control from the securing of raw materials to the marketing of the finished product; (4) a highly developed home market entirely controlled by home manufacturers, a situation which, other things being equal, tends to make any nation the strongest competitor in foreign markets, espe-

cially during periods of depression at home, and (5) a protective tariff which has aided in making control of the home market possible. The importance of the tariff, however, according to James J. Hill, is slight in comparison with our ores. He holds that "the growth of our enormous iron and steel industries, which are pointed out as the result of our protective tariff, can be more surely traced to our magnificent reserves in the iron mines of Michigan and Minnesota than to any other sources. The cheap production of the highest grade of ore in these mines and the low rate of transportation to Lake Erie ports have done more to build up the iron and steel industries of the United States than any tariffs that have ever been placed upon our statute books. To-day if these mines were closed our superiority in the iron and steel trades of the world would be gone forever."[50]

[50] James J. Hill, cited by Dwight E. Woodbridge, in *Eng. and Min. Journ.*, Vol. 79, p. 61.

GEOGRAPHICAL BOOK REVIEWING *

Geographical periodicals were very slow in introducing the feature of book criticism. The Royal Geographical Society was founded in 1830, but it was not until 1879 that it established in its *Proceedings* a review department. The German *Globus* became noted for its trenchant, illuminating book criticisms; but they were first introduced in its fifty-third volume. The periodical of the Vienna Geographical Society was first issued in 1857 and book reviews began to appear in 1868. The Berlin Geographical Society did not print book reviews till fourteen years after its monthly appeared. The initial *Bulletin* of the American Geographical Society was printed in 1852 and its department of "Book Notices" was introduced in 1895.

A conspicuous exception to the rule of belated attention to book criticism is *Petermanns Mitteilungen*. Its first number in 1855 contained four book reviews. The list grew very slowly till it became, as it is to-day, the most comprehensive and systematic review department in any of the geographical periodicals. The publications of most geographical societies now have conspicuous review departments; and one is the product of a commercial publishing house—the annual supplement to *Annales de Géographie*, which prints about 1,200 selected titles a year with concise, informing and suggestive comment.

Before book reviewing in geographical journals was introduced or had become important, bibliographical lists of books and sometimes of maps were published. The Berlin Geographical Society fairly well covered in its lists the best features of the literary output. But the quantity of literature and maps has vastly increased in recent years. The number of books, pamphlets, papers and maps added every year to the geographical and cartographic output now amounts to thousands. Fortunately for geographers, there is perhaps no science whose literary and map output is more fully presented in bibliographical lists than that of geography. The "Geographische Jahrbuch" of Germany, the leader in these lists for many years, has endeavored to cover the entire field of geography by giving the title of every helpful paper, monograph or book, often with short comment, just enough to characterize the work or to indicate its content. Why was it important that in addition to geographical bibliographies we should have geographical book reviews? Bibliographical lists were finally reinforced by book and map reviews in response to a demand for concise definition, description or discussion of work done as set forth in geographical literature. It was found that field exploration, and the results arrived at in other departments of geographical research, needed to be summarized or at least characterized by competent reviewers so that the specialist might more easily decide what in the work of others was most worthy of his attention, in detail, for the benefit of his own work.

Thus staffs of book reviewers were developed in the leading European countries, men who were greatly absorbed in their own lines of work being willing to spare a little time for the general good, expecting themselves to profit by similar sacrifices in the same cause by other experts.

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* Read at the ninth annual meeting of the Association of American Geographers, New Haven, December 27-28, 1912.

It is, however, no easy matter to build up a first-rate department of book criticism. An editor needs all the good collaboration he can get; but it is not very effective till it is experienced collaboration. A geographical society renders a distinct service when it collects a body of experienced critics with a sharp sense of the vital thing to say about a paper or a book. The best departments of geographical criticism have been of slow growth. Dr. A. Supan took the editorship of *Petermanns Mitteilungen* in 1884, twenty-nine years after the first book reviews appeared in it. He felt compelled to announce that he would not be able, in that year, to take his usual part in the preparation of "Bevölkerung der Erde" because he was compelled himself to write nearly all the reviews in the "Literaturbericht," and this practically absorbed his vitality. The idea that a productive geographer cannot spare the time to pass even concise judgment on the merits of a book still persists in some countries; but it has evaporated in most countries where we see the greatest names attached to book reviews—and this is a distinct advantage to geographical science.

The greatest efficiency of review departments in geographical periodicals has naturally been attained in those countries where geography, as a study, stands highest and where its various phases of work are best organized and carried out with the largest results. Germany, on the whole, has a larger equipment of men who represent all or nearly all phases of scientific geography than any other country. Distinguished scholars in her higher schools still supply a much larger number and variety of superior contributions to book criticism than geography commands in any other country. The result is a never-ending survey, helpful and edifying, of all important additions to geographical knowledge, theories and methods as represented in the literary and cartographic output. Such review departments in geographical periodicals may especially be recommended to the attention of the officials of some of our own schools as giving a good idea of the whole content of geography. It was perhaps a mere inadvertence that one of our higher institutions of learning, a few years ago, in announcing the coming inclusion of geography in its curriculum, spoke of that subject as though it embraced only the regional feature.

While some sides of geographical study have been splendidly advanced in our country, it is well known that this is not the case in relation to other phases of our subject. This fact increases the difficulty of securing adequate comment upon the great variety of geographical material that is reviewed at home. The society that is giving most attention in our country to book and map reviews has sent twice to New Zealand because there live the two men who, it is believed, could deal best with certain works published by the Carnegie Institution of Washington. Its review department has availed itself to some extent of German collaboration. The Dutch are continuing their great work of exploration and research in the Dutch East Indies and New Guinea and in the past two years have issued a considerable number of good books; but this society has found only one reviewer at home who, at the same time, has geographical equipment, a working knowledge of the Dutch language, and is available for the helpfulness required. The limited acquaintance of not a few of our geographers with the various languages of Europe often embarrasses or delays the production of reviews.

We have every reason, however, to feel encouraged as to the future in our country of this department of geographical writing. We are passing through the same stages of growth that are a part of the history of geographical de-

velopment in the lands that preceded us in placing geography upon a scientific basis. As in Europe, not a few of our best men have withheld their collaboration, urging lack of time; but more and more of them are recognizing the value of this phase of work and, as book reviewers, are strengthening our geographical publications. There is ample incitement now to push inquiry at home for helpfulness of the very best kind.

The society above mentioned was long unable to secure, in our country, adequate reviews of advanced treatises on mathematical geography and cartography; but specialists both at home and abroad are now in view for this service. It is still difficult in some cases to secure reviews of books written in the Russian and other Slavonic languages.

It may seem surprising that some difficulty is found in securing desirable reviews of the better so-called popular books on geography. Perhaps the chief reason is that not all of our geographers have yet attained such familiarity with the large units of regional geographical study as readily to seize upon the feature or features in these books that really offer something new. A writer, for example, reviewed a book on a small, little-known region east of Uganda in Central Africa. The one noteworthy thing in the book was that the author established the existence there, among a small Bantu people, of an admixture of Bantu and Hamitic elements in language and in custom. The review was pleasantly written but missed the real kernel of the work.

Book reviewers sometimes fall into mistakes that they will avoid as they gain experience. It is usually better to suppress the subjective. A work under review should not be made a text upon which to unfold ideas or theories, not always pertinent, of the reviewer. The political opinions, either of the author or of the reviewer, should have no place in a geographical publication. As geographers we have nothing to do with politics. Discussion in a book review should usually be brief and almost invariably reserved for geographical theory, methods and statements that make controversy permissible.

Many of our book reviews are too long. We may recall the trenchant sentence or two in which Dr. Supan sometimes summed up his opinion of a book while he was still editor of *Petermanns Mitteilungen*. There was really nothing essential to add to his few telling words of characterization. From the viewpoint of many geographers it is better to get at the essence of the book, tell what it is and let it go at that. The function of a reviewer is to announce what is new, commend what is good, and correct error. Epoch-making books like Suess's "Antlitz der Erde" and great books like Krümmel's "Ozeanographie" require extended notice by authoritative reviewers, but they are the great exceptions; and with the press adding thousands of items to geographical lists every year, many worthy books can have only bibliographical entry.

C. C. A.

GEORGIA COASTAL PLAIN GEOLOGY AND PHYSIOGRAPHY*

The study of coastal plain geology involves peculiar difficulties. The Triassic and older rocks, in the eastern United States, can be traced over large areas by lithological characters alone; but in the coastal plain, whose strata are all Cretaceous and later, and mostly not indurated, formations of very different age often look strikingly alike and, more perplexing still, the same formation often varies greatly in appearance in comparatively short distances, especially where it has been subjected to weathering. It is usually important, in order to be sure of the identity of a given coastal plain formation, to have fossils; and outcrops of fossiliferous rock in that region are few and far between, because the coastal plain, as its name implies, has been comparatively little dissected by erosion, and rocky bluffs are chiefly confined to the banks of the larger streams. The interstream areas are mostly covered either with residual soil or with non-fossiliferous superficial formations, which are of no use to the paleontologist.

The usual method of mapping coastal plain geology is to locate the outcrops of each formation on the rivers and connect these by lines, making allowance for the dip of the strata and the elevation of the interstream areas, and taking advantage of any recognizable fossiliferous exposures that may be discovered on the uplands. Where river-bank exposures are rare or absent, the paleontological geologist is often "at sea"; but one who has had sufficient experience with the geography of the coastal plain can often tell a great deal about the geology by noting the topography, soil and vegetation.[1]

In our coastal plain the relations between geology, on the one hand, and topography, soil and vegetation, on the other, seem to be most clearly exhibited in Mississippi and Alabama, about on a line with the axis of the Appalachian uplift, where the region reaches its greatest elevation, about 1,000 feet above sea-level, with an average elevation over large areas of about half that amount. Largely on account of this elevation, and the length of time that this part of the coastal plain has been exposed to erosion, the land surface has been somewhat deeply sculptured, and differences in texture and composition of the strata of different ages are fairly well reflected in the topography. Going eastward on the coastal plain, however, the elevation gradually decreases, until in Virginia tide-water reaches inland to the margin of the crystalline rocks, and the whole plain appears well-nigh featureless to one who knows it best in the eastern Gulf States.

The great topographic and floristic diversity of the coastal plain in Mississippi was taken advantage of, more than a half century ago, by Dr. E. W. Hilgard in mapping the geology of the state in his monumental "Geology and

* Preliminary Report on the Geology of the Coastal Plain of Georgia. By Otto Veatch and Lloyd William Stephenson. *Geol. Surv. of Georgia, Bull. 26.* 466 pp. Maps, ills. Atlanta [1912].

1 Scarcely a hint of any such methods of research is to be found in our geological textbooks; but some valuable suggestions may be gleaned from the writings of D. D. Owen, E. W. Hilgard, E. A. Smith, A. Hollick, R. T. Hill, and a few other geologists knowing something of botany.

Agriculture of Mississippi,'' published in 1860 and, in many respects, not yet surpassed. In Alabama, Dr. Eugene A. Smith, a younger colleague of Dr. Hilgard, after publishing several preliminary papers on the subject, issued from the office of the Geological Survey of Alabama, in 1894, a voluminous report on the geology of the coastal plain, and a large colored geological map of the state, which is still much sought after, though the edition was soon exhausted.[2]

For Florida, Georgia, the Carolinas and Virginia there have been many short papers, but no comprehensive account, until very recently, of the coastal plain geology of either state. To expedite the progress of our knowledge of the geology of these parts of the country, the U. S. Geological Survey, a few years ago, arranged to coöperate with several of the state surveys in prosecuting the work. As a result of this coöperation, a report on the geology of Florida, by three government geologists, was published by the newly-organized state survey in 1909,[3] the one here noticed early in 1912, and one for the coastal plain of Virginia,[4] by three Maryland geologists, about the same time. A similar report on eastern North Carolina[5] appeared in the summer of 1913.

The present work is not the first attempt to describe the geology of the coastal plain of Georgia, as its title would seem to imply, but it contains more information about the geology, and incidentally the topography, of that region than had been brought together in a single volume before. Naturally the map accompanying it is equally noteworthy. With the exception of the large geological map of North America published by the U. S. Geological Survey a few weeks earlier, this is the first strictly geological map which shows the inland edge of the Altamaha formation in Georgia anywhere near correctly. A map of the same formation, identified mainly by its topography and vegetation, was published by the reviewer in botanical papers in 1906[6] and 1907; but a geological map of Georgia published by the State Survey in 1908, 1909 and 1910[7] combined this formation with several others, thus obscuring its boundaries.

The base-map on which the geology is printed in colors is a government post-route map of Georgia about five years old, with nearly all the mail-routes other than railroads eliminated, and the whole reduced to a scale of 1:1,000,000. Georgia, being the largest and latest of the original thirteen states, has never been so accurately surveyed as some of the older and more thickly-settled states, or as the newer states farther west which were surveyed long ago by the township system. Consequently there is no base map of Georgia as yet which does not show errors easily detected by the eye, without any measurement. The post-route map, while remarkably accurate in some respects, even

[2] Geological Map of Alabama, with explanatory chart. Geological Survey of Alabama, Eugene A. Smith, State Geologist, Montgomery, Ala., 1894.

[3] A Preliminary Report on the Geology of Florida with special reference to the stratigraphy. By George C. Matson and F. G. Clapp. Prepared in cooperation between the U. S. Geological Survey and the Florida State Geological Survey under the direction of Thomas W. Vaughan. Maps, ills. *Florida Geol. Surv. 2nd Ann. Rept., 1908–09*, pp. 21–299. Tallahassee, 1909.

[4] The Physiography and Geology of the Coastal Plain Province of Virginia. By W B. Clark and B. L. Miller. With chapters on the Lower Cretaceous by E. W. Berry and Economic Geology by T. L. Watson. Maps, index. *Virginia Geol. Surv. Bull. No. 4*, pp. 13–222. Charlottesville, 1912.

[5] The Coastal Plain of North Carolina. By W. B. Clark, B. L. Miller and others. 552 pp. Maps, ills., index. *North Car. Geol. and Econ. Surv.*, Vol. 3, 1912.

[6] *Ann. N. Y. Acad. Sci.*, Vol. 17, frontispiece.

[7] In *Bulletins 15, 18 and 23.*

outside of the area covered by the topographic maps of the U. S. Geological Survey, is remarkably inaccurate in others, such as in the location of some of the railroads. Probably the most serious error consists in placing the largest pond in the state (Ocean Pond, Lowndes County) several miles northwest of its true position, and making it much too large.

In the spelling of certain geographical names, such as Ochlocknee, Okefinokee, Suwannee, and Purysburg, the authors have followed non-resident rather than local usage. And in nearly every case where a particular river is mentioned the word "the" before the name is omitted; this does not conform with spoken usage, and seems to have almost no precedent outside the publications of the U. S. Geological Survey.

The illustrations are not confined to purely geological subjects and some of them would be perfectly appropriate in a botanical report. Nearly all are new; but some were taken in Alabama and Florida, and one of the latter (plate 2A) was published two years before as plate 6, Fig. 2, of the second *Annual Report* of the Florida Geological Survey. None of them are dated.[8]

The most interesting part of the report, to geographers and geomorphologists, will be Veatch's chapter (pp. 25-57) on physiography. Six divisions of the coastal plain are recognized (and mapped in outline on page 28): Fall-line Hills, Dougherty Plain, Altamaha Upland, "southern lime-sink region," Okefinokee Plain, and Satilla Plain. Some of these, especially the first, are entirely too heterogeneous, and a somewhat larger number would have been better for geographical purposes. Ten divisions of the same area were described, and eight of them mapped, by the reviewer in 1906.[9] The "southern lime-sink region" is represented as being in contact with the Dougherty Plain for about thirty miles, which is an error, for they are really completely separated by several miles of the Altamaha Upland, which is a very conspicuous feature in the southwestern corner of the state and adjacent Florida. The geological map is more accurate in this respect. Placing the Fall-line Hills and Altamaha Upland in juxtaposition from near Sandersville to the Savannah River is also questionable.

One of the most remarkable topographic features of the flatter parts of the coastal plain, a low ridge skirting the east side of Okefinokee Swamp and extending parallel with the coast for over 100 miles in Georgia and Florida (known in Florida as Trail Ridge), is dismissed in a few words. It has never yet been explained by the geologists of either state. It is much more conspicuous, though, than the lower ridge to the eastward which has been taken by Veatch for the boundary between his two easternmost plains.[10] The "Slough" of Mitchell County, though shown on the map, is ignored entirely in the text, and that too has never been explained, or even mentioned in geological literature.[11] Other unexplained topographic features are the sand hills on the left banks of creeks and rivers (discussed on pages 449-450, 454-456) and the islands along the coast. Some of the interpretations of other topographic features seem open to question.

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[8] There is much to be said in favor of dating photographs. The date of a photograph ought to be as important as that of a botanical or zoölogical specimen.

[9] *Ann. N. Y. Acad. Sci.*, Vol. 17. pp 13-20.

[10] For notes on these ridges see *Pop. Sci. Monthly*, Vol. 74, 1909, pp. 601-604; also *Annual Rep. Florida Geol. Surv.*, Vol. 3, 1911, p. 225; and *Bull. Torrey Botanical Club*, Vol. 38, 1911, p. 230.

[11] *Bull. Torrey Bot. Club*, Vol. 30, 1903, pp. 288-289.

Most of the purely geological portions of the text appear to be above criticism. As usual in recent publications of this character, the authors have proposed several new formation names.

Doubtless as a result of the modern tendency to specialization in education, the authors do not seem to have a working knowledge of botany, and thus an important aid to their geological studies has been lacking. Neither have they (nor any one else in that region, apparently) utilized to the utmost the possibilities of interpreting geology by means of topography in regions where fossils are lacking, as suggested above.

Most of the important previous geological papers on the region are mentioned in the text or in footnotes, but the names of authors are not fully indexed. The index fills only ten pages, and there is no bibliography, so that it is not easy for the reader to make sure whether any particular paper has been cited or not. Otherwise the report seems nearly complete, and it will doubtless be a standard reference work for years to come. ROLAND M. HARPER.

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

The Society's Exhibitions. The Society has received from the Bureau of Science, Manila, a series of 244 large photographs illustrating many phases of the Philippines and especially the development of the country since the American occupation. The photographs include series showing the improvements in Manila harbor; the native dwellings that were destroyed for sanitary reasons and the dwellings that have replaced them, the fine buildings of the Bureau of Science, the municipal government, the Philippine medical school, the general hospital, etc.; a large number of views of the Tagalogs, mixed breeds, native tribes; public schools, many agricultural and manufacturing industries, etc. The exhibition is now open to the public.

The maps illustrating the field of war, most of which have been on exhibition since August 7, are still attracting many visitors. The total attendance up to October 26 was 15,032. Thirty of the finest maps showing the war areas are now on the racks, some of them (in sheets) covering a larger surface than most wall maps. The exhibitions of the Society are open to the public from 10 A. M. to 5 P. M. on week-days and from 2 to 5 P. M. on Sundays.

Dr. and Mrs. Workman Address the Society. The Society's lecture season of 1914-1915 was opened by an extra inter-monthly meeting at the Engineering Societies' building, No. 29 W. Thirty-ninth Street, on Nov. 10th, at 8.30 P. M., when Dr. and Mrs. Workman spoke on the most recent phase of their notable work in the Eastern Karakoram. Mrs. Workman opened the evening with a paper on "The Exploration of the Great Rose Glacier, Eastern Karakoram," and Dr. Workman followed with a description of the "Physical Features of the Rose Glacier." The superior lantern views, in most cases, sharply defined glacial and mountain aspects at elevations thousands of feet higher than any ever displayed before on our platform.

NORTH AMERICA

The Weather Bureau Resumes Seismological Work. Congress having given authority to the Weather Bureau to conduct seismological work beginning with July 1, 1914, this service will accordingly be resumed. Professor C. F. Marvin, Chief of the Weather Bureau, says that the work will consist at first of a systematic collection of non-instrumental reports giving the essential features of such slight earthquakes as are likely to be felt in almost any part of the United States. Particular attention will be paid to the Pacific coast and Rocky Mountain regions, the Mississippi Valley in the neighborhood of Missouri, some parts of New York State and New England, and possibly the region near Charleston, S. C. By the collection of numerous reports of this character, it is believed that sections of the country may be determined where seismic motion on existing fault lines is taking place with some frequency and regularity. The location and mapping of these points of weakness are of great importance in the conduct of certain kinds of engineering work, especially those relating to great water-supply projects.

The development of the work along instrumental lines will proceed as rapidly as funds permit. The establishment is contemplated of a limited number of instrumentally equipped stations that will yield records not only of sensible seismic phenomena but also of the great unfelt vibrations resulting from large, distant earthquakes. The work will be under the supervision of Prof. William J. Humphreys (*Monthly Weather Review,* June, 1914, p. 393).

Proposed Historical Atlas of the United States. For two years past the Department of Historical Research at the Carnegie Institution has given considerable time to planning an atlas of the historical geography of the United States and collecting materials for its construction. Several specialists, including Prof. Frank H. Hodder of the University of Kansas, Prof.

O. G. Libby of the University of North Dakota, Prof. Max Farrand of Yale University and Prof. Jesse S. Reeves of the University of Michigan, each proficient in one or more subjects to be covered by the atlas, have been called to Washington to conduct investigations for the proposed work. The Department of Historical Research wishes to make the atlas of the greatest possible use to the teachers and writers of American history and is seeking all the helpful cooperation that can be secured.

According to present plans the completed atlas, exclusive of text, will contain 200 pages measuring about 22 by 14 inches. The largest maps will be approximately full-page maps, many others will be about one-fourth that size and many still smaller. The area covered will be generally the whole or a part of continental United States. It may occasionally be found desirable, however, to represent our detached possessions, adjacent parts of Canada and Mexico, the West Indies and parts of the North Atlantic and North Pacific Oceans. Excepting maps illustrating the geology of the country and its early aborigines, all the maps will fall within the period from the discovery of America in 1492 to the present time. The general headings are expected to include physical geography, aborigines, early maps of America, routes of explorers and colonizers, boundaries and divisions, industrial and social maps, and political, city and military maps. A considerable portion of the atlas will be devoted to political statistics, which will be treated somewhat after the method of Professor Turner and his students. It is to be hoped that the specialists in charge will have all the collaboration that can add to the value of the proposed atlas.

Depths of New York Bay and Harbor. The "Table of Depths for Channels and Harbors" on coasts of the United States (1913), recently issued by the Coast and Geodetic Survey, contains the following figures, in feet, for the depths of New York Bay and Harbor:

New York Bay	Mean Low Water	Mean High Water	New York Harbor	Mean Low Water	Mean High Water
Gedney Channel................	30	34½	Bay Ridge Channel..........	38	42½
Main Channel..................	30	34½	Red Hook Channel...........	30	34½
Swash Channel.................	25	29½	Buttermilk Channel.........	28	32½
Ambrose Channel...............	40	44			
Coney Island Channel.........	17	21			

The Carnegie Returns from Her Latest Cruise. The magnetic survey vessel *Carnegie* arrived at Brooklyn on October 31, having completed a cruise of about 10,000 miles this summer in the North Atlantic Ocean. On her way from Hammerfest, Norway, to Reykjavik, Iceland, she reached the latitude of 79° 52′ N. off the northwest coast of Spitzbergen. Mr. J. P. Ault of the Department of Terrestrial Magnetism was in command of the vessel and was assisted in the scientific work by Dr. H. Y. W. Edmonds and Messrs. H. F. Johnston, I. Luke and N. Meisenhelter.

Our Mineral Reserves. The U. S. Geological Survey has just published, as Bulletin 599, "Our Mineral Reserves; How to make America Industrially Independent." George Otis Smith, the author, discusses the mineral production, the situation with regard to our own extractive industries, the great reduction in the European output of minerals and metals likely to be caused by the war and the increase in our own productivity that may be practicable not only in extractive but also in the manufacturing industries. He says that the United States mined nearly 40 per cent. of the world's output of coal and produced 65 per cent. of the petroleum in 1913. Forty per cent. of the world's output of iron ore is raised from American mines and the smelters of the United States supply the world with 55 per cent. of its copper and at least 30 per cent. of its lead and zinc. On these raw materials the great metallurgical industries have been founded, but they would suffice for the support of much more extensive chemical and metal-working industries.

In the list of metal and mineral imports last year the larger items, named in the order of value, were unmanufactured copper, precious stones, nitrate

of soda, copper ore and matte, nickel, tin, iron ore, pig iron and steel, petroleum products, manganese ores and alloys, platinum, aluminum, pyrite, graphite, stone, potash and magnesite. Mr. Smith shows that this country has an abundant supply of most of these products, and that, as far as they are concerned, it can be independent of foreign countries. The only essential minerals of which the United States has no supply commensurate with its needs are nitrates, potash salts, tin, nickel and platinum. Probably no other nation so nearly approaches absolute independence in respect to mineral resources.

War Exhibit at Columbia University. An exhibition dealing with the geography of the area affected by the European war, consisting of maps, block diagrams, etc., is being held under the auspices of the Department of Geology of Columbia University in the department's library, Room 301, Schermerhorn Hall.

AFRICA

Irrigation in the Sudan. Just before the war began it was reported in England that the building of the two great dams to be erected in the Sudan would be commenced this year. The dam across the Blue Nile is to provide water for the irrigation of the large district of the Gezira. This district, enclosed in the triangle formed by the junction of the White and Blue Niles, forms the most fertile portion of the Sudan. It only requires irrigation to render it one of the finest grain-producing areas in the world. The dam across the White Nile is intended to safeguard Egypt against the evil effects of an abnormally low or high flood, both of which are equally disastrous. Funds for the former project are to come out of the Sudan loan while money for the latter is to be provided by the Egyptian Government. The Sudan Irrigation Service has been completely reorganized so as to be in a better position to cope with the forthcoming work.

Enlarging Cape Town Harbor. The work is advancing satisfactorily of enlarging this harbor so that within two years from now it will be possible to accommodate vessels measuring 750 feet in length and drawing twenty-eight feet of water. The traffic between Europe and Australasia, *via* the Cape, is constantly increasing and it is regarded as important that Cape Town Harbor, which occupies the position of half-way house, should compare favorably with the harbors of Australia and New Zealand.

Protecting Big Game in Africa. International movements for the protection of elephants and rhinoceroses in Africa are not likely to have much effect for some time to come; but it is interesting to know that, according to reports published in various issues of the *London Times* shortly before the war began, efficient efforts to devise better protection for these animals in Africa had been far advanced. An international conference was held in the second week of May at the Foreign Office in London, with Lord Chelmsford presiding, at which representatives of all the European states possessing territory in Africa were present.. Existing regulations for the protection of elephants and rhinoceroses, it was reported, were not observed equally throughout the African territories and without such equality their efficiency was greatly impaired. The conference arrived at an agreement which, when ratified by the governments concerned, was expected to prove a distinct step in advance. The recommendations are said to have included the formation and maintenance of sanctuaries for elephants and rhinoceroses in suitable localities; the shooting of these animals to be permitted only on licenses to be made as nearly as possible identical in the different territories. In the case of rhinoceroses, absolute protection was recommended for a number of years and, as regards ivory, the standard weight for export was to be raised to over twenty-two pounds.

ASIA

To Study the Tribes of the Yenisei. It is announced in *Nature* that an expedition under the leadership of Miss M. A. Czaplicka, who holds

a traveling scholarship of Summerville College, Oxford, is being sent out by the universities of Oxford and Moscow to study the tribes of the Yenisei region. The other members of the expedition are Mr. H. A. Hull, in charge of physical anthropological work, Miss Haviland, zoologist and ornithologist, and Miss Curtis, photographer. The tribes to be investigated are the Tungas and Ostiaks of the Yenisei, both with Mongoloid affinities, though they are physically distinct. The expedition will be absent about a year and is well equipped for the work.

AUSTRALASIA AND OCEANIA

Nuggets. A "List of Nuggets found in Victoria" is published as No. 12 of the *Memoirs* of the Geological Survey of Victoria, Australia. The *Memoir* includes a description and the history, as far as known, of 1,327 nuggets found in that state. "Victoria has not only proved itself a land unusually rich in gold, but nuggets have been more lavishly distributed in this state than elsewhere and in sizes that have never been exceeded." It was once thought that alluvial nuggets resulted from the aggregation of gold while in the gravels and that an originally small piece might increase in size and ultimately become a nugget. This theory is not borne out by an examination of the surfaces of alluvial nuggets, which invariably show much scratching and rounding; and the common occurrence of angular quartz with the gold does not favor this view. Many nuggets are thoroughly rounded by the action of water; others are water-worn on one side only. Nearly all the nuggets were obtained in the "indicator" country between Ballarat on the south, Wedderburn on the north, Tarnagulla on the east and Ararat on the west. Some very heavy nuggets were found not on bed-rock but several feet above it in the ground. In the case of the Welcome Stranger nugget, the largest found in Victoria (2,284 troy ounces net), there were 68 pounds of quartz associated with the gold. No evidence has been found that accretion of gold occurs so as to enlarge the size of nuggets in the drifts, but there is ample proof that in some cases drift waters contain gold in solution.

Fanning Island. Newspapers say that the Germans had taken Fanning Island, a British possession, apparently to serve as a Pacific base on account of the loss of Samoa. The island has deposits of phosphates and a pearl-shell fishery in its lagoon, but its chief importance is the fact that it is a station of the Pacific cable which extends from British Columbia to Australia through Norfolk Island and Fiji and connects with New Zealand by Norfolk Island. This cable was cut by the Germans; but later, the British reoccupied the island and repaired the cable.

EUROPE

Some Effects of the War on Geographical Interests. Mr. Hugo Wichmann, who prepares the "Forschungsreisen" for *Petermanns Mitteilungen*, refers, in the October number of that periodical, to the unfavorable effect that the war is naturally having upon geographical exploration. Many field projects have been abandoned and parties that started out for field work have returned either to enter the army or because present conditions have curtailed their resources for exploration. Many men engaged in surveys in what has become hostile territory cannot continue their activities. Geographical publications have lost their connection with sources of geographical information by the suspension of postal facilities in many directions. *Petermanns Mitteilungen* is now receiving only a small part of the geographical publications that are usually sent to it. The *Mitteilungen* requests that all geographical societies, explorers and others as far as possible send their reports on explorations and other information intended for its pages through the geographical societies or other correspondents in the neutral countries.

Some Victims of the War. As was to be expected, the names of men known in geography and allied fields of work are beginning to appear in the death lists sent from the fighting lines. Among them are:

General Georges-Joseph Toutée of France, 59 years old, well known for

his exploration of the hinterland of Dahomey and of the middle course of the Niger and for his books, "Dahomé, Niger, Touareg" and "Du Dahomé au Sahara"; Dr. Constantin Guillemain of the Technical High School in Aachen, Germany, known for his explorations in Katanga and Kamerun, his most important publication being "Beiträge zur Geologie von Kamerun"; also Dr. Erich Scholz, a government geologist in German East Africa, and Dr. Heinrich Müller, a geologist in the Royal Prussian Geological Survey.

POLAR

Antarctic

Icebergs of the Southern Hemisphere. The renewal of Antarctic exploration and research will bring into prominence the importance of the knowledge of ice conditions in the south polar regions. It is probably well known that the monthly meteorological charts of the Indian Ocean issued by the Meteorological Office usually contain particulars of icebergs of the southern hemisphere, with charts. The issue for September, *e. g.*, gives tables of icebergs met with each month during the last twenty-nine years, and also between January and May of this year. The summaries published during past years show that the epochs of frequency are variable, and that bergs may be met anywhere south of the parallel of 30° S. Heights of from 800 to 1,700 feet are not uncommon, and, in several instances, the lengths have been estimated to extend to many miles. It is stated that, unfortunately, angular measurements are seldom recorded. (*Nature,* Aug. 27, 1914, p. 670.)

Arctic

Dr. Bruce's Spitzbergen Expedition. The *Bulletin* announced the departure of Dr. W. S. Bruce from Edinburgh with a small party on an expedition to Spitzbergen early in July. He, with his scientific staff, consisting of Mr. J. V. Burn Murdoch, Mr. Robert M. Craig, geologist, and Mr. John H. Koeppern, zoologist, returned to Scotland on Sept. 18. *The Scottish Geographical Magazine* (October, p. 548) says that Dr. Bruce reports good health for his party and no accidents during their work. Some difficulty was experienced in carrying on the survey work, as the atmospheric conditions were not very favorable and there was an exceptional quantity of ice. It had been intended to continue investigations until the end of September, but the outbreak of the war made it necessary to go home earlier than was expected. An account of the work done will be published later.

The Sedoff Arctic Expedition. This Russian expedition which set out two years ago, under somewhat unfavorable auspices, with the design of reaching the North Pole by way of Franz Josef Land, according to news received in St. Petersburg about the end of August, has had a disastrous termination through the death of the leader. The first winter was spent in Novaya Zemlya, whence a part of the expedition returned to Russia at the end of the summer of 1913. Captain Sedoff, however, determined to persevere in his original plan in spite of the inadequate equipment which he was generally supposed to have at his disposal. According to the statement now made, he appears to have wintered once more in or near Novaya Zemlya (the winter quarters in both years are now said to be in "newly discovered territory"), and to have proceeded during the present year to Franz Josef Land, whence he started for the Pole with two sailors. On the way he fell ill and died. The surviving members have arrived in Archangel. (*Geogr. Journ.*, Oct., 1914, p. 411.)

The New Islands North of Siberia. *The Scottish Geographical Magazine* (Oct., 1914, p. 543) says that the geology of the new islands in the Arctic Ocean of Siberia discovered by Captain Vilkitsky (see "Nicholas II Land," *Bull. Amer. Geogr. Soc.*, 1914, No. 2, pp. 117-120) has been investigated, so far as the specimens of rocks brought home allowed, and the results are discussed by Messrs. Baklund and Tolmachef in the *Bulletin* of the Imperial Academy of Sciences of St. Petersburg. The new island in the New

Siberian group (mapped in the *Bulletin*, Feb., 1914, p. 117) between the New Siberian Islands and Bennett I., which has been named after Captain Vilkitsky, has been found, as was to be expected, to be of geological structure similar to that of the adjacent islands of the group. Similarly the rocks collected on Nicholas II Land are identical with specimens taken from the east coast of Taimyr Peninsula. Nicholas II Land is thus a northern continuation of the peninsula, from which it is now separated by a strait. The smaller island off Cape Chelyuskin (marked as "new island" on the *Bulletin* map), which has been named after the Czarevitch Alexis, is built up of the detritus derived especially from the west coast of the Taimyr Peninsula. However, as specimens from Nicholas II Land have only been obtained from two localities, further observations may modify the conclusions now arrived at.

PERSONAL

Professor Albert Perry Brigham has returned to his work after spending the past year in Europe. In August last he gave a course of seven lectures before the Oxford University School of Geography, upon the topic, "Regional Development and Conservation Problems in the United States."

Professor W. M. Davis visited New Caledonia, the Loyalty Islands and the New Hebrides, in June and July, in connection with his Shaler memorial study of coral reefs in the South Pacific. In August he took part, as a foreign guest, in the Australian meeting of the British Association for the Advancement of Science at Adelaide, Melbourne and Sydney. He received the degree of Doctor of Science from the University of Melbourne; at Sydney he spoke before the section of geography on "The Coast of New Caledonia," and before the section of geology on "New Evidence for Darwin's Theory of Coral Reefs." In late August and early September, he made a short visit to the Great Barrier reef of the Queensland coast, and on Sept. 11 sailed from Sydney *via* New Zealand for the Society Islands, whence, after a month given to an examination of six members of that group, he sailed for San Francisco, arriving there Nov. 4, and reaching Cambridge, Mass., Nov. 9.

Dr. Otto Finsch, the well-known ethnographer and geographer of Brunswick, Germany, celebrated on Aug. 8 his seventy-fifth birthday. His field work was widely distributed. He was the first scientific man to publish a book on a part of the coastal regions of Kaiser Wilhelm Land in New Guinea.

It will gratify all who know Dr. H. R. Mill, personally or through his work, to hear that he has returned to England in good health, after his long vacation in Australasia, and has resumed the editorship of *Symons's Meteorological Magazine.* Mr. R. C. Mossman, who acted as editor of the magazine during Dr. Mill's absence (from the issue of November, 1913, to that of August, 1914), has decided to return to his meteorological duties in South America.

Dr. Eugen Oberhummer, Professor of Geography at the University of Vienna, was appointed visiting Austrian Professor to Columbia University for the present academic year. In spite of the war, Professor Oberhummer is expected to be in residence at Columbia during the second half year.

Professor Dr. Joseph Partsch, Professor of Geography at Leipzig University, has declined a call recently received from the University of Berlin.

Professor R. H. Whitbeck, Editor of the *Journal of Geography,* has received a leave of absence from his work at the University of Wisconsin until Feb. 1, 1915. From October to February he will be with the Historical Division of the Carnegie Institution at Washington. During this time Prof. Lawrence Martin will have the editorial management of the magazine.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

(The size of books is given in inches to the nearest half inch.)

NORTH AMERICA

Nantucket: A History. By R. A. Douglas-Lithgow. xiii and 389 pp. Map, ills., index. G. P. Putnam's Sons, New York, 1914. $2.50. 9½ x 6½.

This historical record of Nantucket brings down Obed Macy's History of 1835 to the present day and will be invaluable to all lovers of the sea-girt island off the southern coast of Massachusetts. The chapter on the geology and physiography gives the results of the latest research and shows that Nantucket is but a fragment of a vast sheet of glacial deposit. The chapter on the aborigines tells the usual sad story of the overwhelming and obliteration of the native race. The writer quotes the somewhat severe words of Obed Macy: "Their only misfortune was their connection with the Christians, and their only crime the imitation of their manners." The story of how the Quakers sought freedom of worship in Nantucket, and the account of the characteristic Nantucket industry—the whale fishery—are entertaining. The whaling business was greatly impaired in the Revolutionary War and the War of 1812, and reached its height in 1842, having eighty-one ships, two brigs and schooners, in all 36,000 tons. It began to decline on the discovery of gold in California, and in 1869 the last whale ship sailed from Nantucket. Among the eminent Nantucketers are Maria Mitchell, Lucretia Mott, the Rev. Phoebe A. Hanaford, the Rev. Ferdinand C. Ewer, D.D., and Capt. George W. Coffin, U. S. N.

David H. Buel.

A History of Connecticut, Its People and Institutions. By George L. Clark. xx and 609 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1914. $3.50. 9 x 6½.

An appreciative account of the upbuilding of the Connecticut Commonwealth. It is indeed a far cry from the theocratic state of the Early Independents, who ill-brooked the masterful ways of their fellow Puritans of the Massachusetts Bay Colony, and sought freedom of worship and political independence in the wilds of the Connecticut River valley and sea-coast, to the present day Connecticut, where Church and State are separate; where the Celt, the Latin and the Slav, each with his own ancestral worship, are drinking in the atmosphere of Connecticut independence, while they man silk mill, machine shop, clock factory and farm. The days of Indian warfare, of blue laws and of witchcraft are gone, never to return. The prominent part taken by Connecticut in the formation of the National Constitution, in the wars for independence and between the states, its leadership in mechanical invention, in commercial industry, in educational uplift, in philanthropic service are well brought out and accentuated. The condensed account of the founding, growth and expansion of Yale will be of interest to all Yale devotees, who no doubt can scarcely recognize in the bygone Yale, where the students conversed in Latin, the young Yale of to-day. An ominous factor in the future welfare of the state is the excess of deaths over births among native-born citizens of nearly 3,000 annually for a number of years. David H. Buel.

Les États-Unis d'Amérique. Par D'Estournelles de Constant. ix and 536 pp. Map, index. Armand Colin, Paris, 1913. Fr. 5. 7½ x 5.

Few interpretations, by foreigners, of the country and the turn of mind of its inhabitants will compare for accuracy with this work. Intelligent observa-

tion and clear thinking have been brought into play. Although no claim to scientific treatment is made, the book reveals the cultural value of geographical equipment for writing such a work. None of the burning questions in the United States appear to have escaped the writer's notice. In dealing with each he has drawn upon the best which the Old World's culture could afford, and yet his conclusions differ in nowise from those reached by the best-informed Americans. LEON DOMINIAN.

Voyage aux États-Unis de l'Amérique, 1793–1798. By Moreau de Saint-Rémy. Edited with an introduction and notes by Stewart L. Mims. (Yale Historical Publications.) xxxvi and 440 pp. Ills., index. Yale Univ. Press, New Haven, 1913. $2. 9 x 6.

This is not the only occasion on which the Yale University Press is to be congratulated on its selection of historical documents for publication. The present narrative is an excellent presentation of conditions shortly after the Declaration of Independence. Nothing appears too insignificant to attract the author's versatile mind. He skips lightly from Franco-American relations to American servants as he found them in Pennsylvania, or to the commerce of New York, and manages to crowd an amazing wealth of detail in each description. The vision of this outsider has been so sweeping that his book is probably more valuable to us, at present, than to the Frenchmen for whose eyes it was intended. LEON DOMINIAN.

The Economic History of the United States. By Ernest L. Bogart. 2nd edit. 597 pp. Maps, ills., index. Longmans, Green & Co., New York, 1913. $1.75. 8 x 5½.

That "the keynote of all American history is found in the efforts of a people to appropriate and develop the natural resources of a new continent and there to realize their ideals of liberty and government" is the general thesis of Professor Bogart. The thirty-three chapters trace the development of agriculture, finances, manufactures, commerce and population from simple colonial conditions to modern complexity. The materials are arranged chronologically under the headings: Colonial Development, Struggle for Commercial and Economic Independence, the Industrial Revolution and the Westward Movement, Economic Integration and Industrial Organization.

The sixteen pages of Chapter I treat of the "Land and Its Resources," including paragraphs on coast lines, water power, coal, iron, animal life, forests, soil and climate, and here is contained nearly all the geographic material which is presented. It would seem to the reviewer that an adequate geographic background is necessary for the reader to follow intelligently the economic development of the people. For example, the success of the Erie Canal and the subsequent development of canals in Ohio, Indiana and Illinois were in part due to the easy routes which were the results of fluvio-glacial action, and it would seem that an explanatory paragraph would be well worth while. A misconception appears on page 79, where the Fall Line is described in New England, while the map on page 5 correctly shows the northern end of the Fall Line as terminating in New Jersey.

The book is "meaty" and the author has succeeded in presenting much statistical matter in an interesting manner. The inclusive bibliography is a useful feature and the entire book should be useful as a reference book in geographical study. F. V. EMERSON.

Frémont and '49. The story of a remarkable career and its relation to the exploration and development of our Western territory, especially of California. By F. S. Dellenbaugh. xxiii and 547 pp. Maps, ills., index. G. P. Putnam's Sons, New York, 1914. $3.50 9 x 6½.

A handsome tribute to the "Pathfinder whose camp fires have become cities." It is an appreciative but withal impartial account of the pioneer work of the explorer and engineer who mapped out the course of a railroad to the Pacific Coast and did so much to add California to the territory of the United

States. It clears his memory from unjust suspicions and charges, but plainly admits mistakes and errors on his part, where they are really to be found. The portrait that stands out from the pages of this book is that of a high-minded, cultured and refined gentleman, a fearless and indomitable geographer and explorer, a man of clear mind and sterling principle, incapable of deceit and subterfuge, the uncompromising advocate of freedom for the negro, the first to issue an emancipation proclamation, removed from office by the man who issued the final emancipation proclamation because he refused to recall his own declaration of freedom for the slave. Two incidents recorded in the work mark the man as he really was. In his first disastrous attempt to cross the Rocky Mountains in the dead of winter so as to find out the practicability of a railroad route, one of his rescue parties, in the face of starvation, supported their life by means of the body of one of their number who had died. On his next attempt, when his party was in danger of being reduced to similar straits, Frémont got his men to make a compact that they would stand and fall together and warned them that he would shoot any man who proposed to do as the previous party had done. On this expedition he was rescued from starvation by a Mormon settlement, and thereafter spoke well of the Mormons and refused point blank to introduce a well-known female lecturer who opposed them. The author comes to the reluctant conclusion that the official censure to which Frémont was subject was due to opposition shown him by West Pointers. But West Pointers themselves have been similarly treated.

DAVID H. BUEL.

Rambles in the Rocky Mountains, with a Visit to the Gold Fields of Colorado. By Maurice O'Connor Morris. viii and 264 pp. Smith, Elder & Co., London, 1864. 8 x 5½.

Mainly the author's daily notes on a journey from the gold fields west of Denver. The commonplaces of frontier life were novel and the author gives us interesting sketches of the further Middle West toward the close of the Civil War. There are intelligent descriptions of the topography, but the writer's main interest lies in the life about him. He comments on the social segregation of the races in Denver, but predicts that the negro will gain wealth and with this lever rise to social equality. The book is a readable account of pioneer life.

F. V. EMERSON.

Ten Thousand Miles with a Dog Sled. A Narrative of Winter Travel in Interior Alaska. By Hudson Stuck. xix and 420 pp. Map, ills., index. Charles Scribner's Sons, New York, 1914. $3.50. 9 x 6½.

The book describes the journeys of the Archdeacon to the various parts of his diocese. The area lying between the 62nd and 68th parallels of north latitude and between the Canadian boundary of Alaska and Bering Strait has been well covered by this intrepid man. He imparts an intimate knowledge of the country and the weather; his mission makes his characterization of the natives of great value, and his many years of service lend weight to his opinions. The author fulfills his promise to bring the reader into contact with the physical attractions of the Alaskan land, "the gentle aboriginal population" and "some of the hardiest and most adventurous white men in the world."

ROBERT M. BROWN.

The Ascent of Denali (Mt. McKinley). A narrative of the first complete ascent of the highest peak in North America. By Hudson Stuck. 188 pp. Map, ills. Charles Scribner's Sons, New York, 1914. $1.75. 8½ x 6.

A wonderful record of indomitable pluck and endurance. A Doctor of Divinity, the Venerable Archdeacon of the Yukon, verging on fifty years, not an expert mountain climber, with a party no more expert than himself, attacks the problem of ascending the loftiest mountain in North America, and after a two months' campaign against ice and snow, carrying a full man's load of supplies and instruments on his back, staggering and panting for breath in the rare atmosphere, he stands on the topmost peak of Mt. McKinley. After

taking scientific observations with the barometer and the mercurial thermometer and making the standard corrections, he determines the altitude to be more than 20,000 feet. Other valuable data of the expedition are that the aneroid barometer is valueless above 11,000 feet and that amber glass spectacles are a perfect preventive of snow blindness. DAVID H. BUEL.

Alaska, an Empire in the Making. By John J. Underwood. 440 pp. Ills. Dodd, Mead & Co., New York, 1913. $2. 8½ x 6.

A descriptive travel narrative of great interest. To the student of nature it is the unfolding of the popular side of science. Every traveler and prospective tourist of that land will find the reading both beneficial and interesting. The casual reader, who reads the book merely to pass the time, will probaly find it one of the best means to secure a general yet striking knowledge of Alaska and its customs. The surface, the content and the covering of the land, with the many resulting industries, are well portrayed by Mr. Underwood's collection of reminiscences, notes, and facts otherwise obtained.

It is not, however, a scientist's book. While it does contain valuable and accurate information, it is nevertheless non-technical. It treats intelligently of the various sciences, but instead of scientific terms, popular language is used. On the whole, it is a most interesting and instructive treatise on our northern territory. G. E. CONDRA.

Dictionnaire des Rivières et Lacs de la Province de Québec. Par E. Rouillard. 432 pp. Dept. des Terres et Forêts, Quebec, 1914. 10 x 7.

This volume is accurately described by its title, for it includes descriptive notes upon practically all of the rivers and lakes of Quebec which, at any time in history, have been visited or explored. The notes vary in length from a line or two to a page or more, according to the relative importance, in the opinion of the writer, of the objects described. Part I, 188 pages, treats the rivers of the whole province in alphabetical order; but in Part II the regional method is followed, although in order to add to the utility of the dictionary both the regions and the lakes listed within them are arranged alphabetically. The work should prove of considerable interest to students of Canadian history and geography, as well as to those who travel within the province of Quebec. AVARD L. BISHOP.

Canadian Nights: Being Sketches and Reminiscences of Life and Sport in the Rockies, the Prairies, and the Canadian Woods. By the Earl of Dunraven. 296 pp. Charles Scribner's Sons, New York, 1914. $2. 8½ x 5½.

An interesting volume, written in an easy, attractive style, composed of a series of sketches which appeared originally in *The Nineteenth Century*. There are separate sections on such topics as moose-hunting in Canada, sheep-hunting in the mountains, wapiti-running on the plains, Newfoundland in the seventies, etc. Although the scenes of most of the sketches are portions of British North America, parts of the far western United States form the geographical basis of some of the stories. There is not a great deal in the book to attract the serious student of geography. There is, however, much to interest the general reader, and to the true sportsman, whose principal diversion is the hunting of big game, the book should make the strongest appeal. AVARD L. BISHOP.

Labrador: The Country and the People. By Wilfred T. Grenfell, and others. New edition, with additional chapters. xii and 529 pp. Ills., index. The Macmillan Co., New York, 1913. $2.50. 8 x 5½.

A new edition of this popular book with additional matter and a new chapter on conservation. The eighteen chapters cover history, geology and physiography, people, missions, animals, plants and conservation.

Prof. R. A. Daly gives a readable and popular account of the geology and physiography. The rocks are mainly the complicated pre-Cambrian "basal complex" of igneous and metamorphic origin, the surface of which through long erosion has been worn to an "almost plain" (peneplain). In Paleozoic time this surface was covered with water in which were deposited thick beds

of sedimentary rocks, which a later elevation exposed to such effective erosion that, in the coast regions at least, only patches are left. The continental glaciers of the Glacial Period thoroughly scoured the eroded surface, but notably failed to deposit much material, hence the scanty soil and the scarcity of till and moraines.

Probably the average reader turns with most interest to Dr. Grenfell's chapter on Missions, a work which his writings and lectures have made so well known. He has also written the chapters describing the people and the animal life, all giving an intimate view of these topics. Appendices by various authors contain scientific descriptions of insects, marine crustacea, mollusks, mammals and birds. A useful bibliography is also included.

Dr. Grenfell believes that the most hopeful economic future of Labrador lies in the preservation of the game and fur-bearing animals; he would make the region a huge game preserve. Practically all the valuable fish and game have shown serious diminution under unrestricted exploitation. Reindeer herds have already proved a success in a small way. One's imagination is aroused by the statement that the Grand Falls and Rapids in the Hamilton River would furnish enough power to operate most of the factories and railroads of Canada.

F. V. Emerson.

Mexico To-day: Social, Political and Religious Conditions. By George B. Winton. x and 235 pp. Map, ills., index. Missionary Education Movement of the United States and Canada, New York, 1913. 50 cents. 7½ x 5.

Starting with the geology, geography and people of Mexico, the author next takes up the political history from the empire of Montezuma to the present time. He tells of the religions of Mexico, ancient and modern, and of the social and moral status of the people. He points out the causes which have helped to keep the lower classes in a state of degradation, and he shows how Protestant missions and education are uplifting the people to a higher plane of life. He points out what great opportunities Mexico offers to those interested in missionary work. An appendix includes, among other subjects, a condensed account of the constitution and government of Mexico, statistics of Protestant missions, and a bibliography of books and magazine articles on Mexico. Numerous illustrations, and a map in colors, add to the value of this well-written book.

Wilbur Greeley Burroughs.

The Mexican People: Their Struggle for Freedom. By L. Gutierrez de Lara and Edgcumb Pinchon. xi and 360 pp. Map, ills. Doubleday, Page & Co., New York, 1914. $1.50. 7½ x 5½.

A book giving unusual insight into the ethnological, economic, and religious factors which have determined, in large part, the history of Mexico. We see here enacted, under a peculiar stage-setting, the old tragedy of the struggle of the working classes against the landholding, moneyed classes, who exploit the services of the toilers for their own profit and advantage. The work contains a deal of plain speaking on the inside facts of the Mexican war, the Porfirio Diaz régime and the recent Constitutionalist struggle, which makes it well worthy of perusal. The Church looms large in the history of Mexico, as in all other lands colonized by Spain, and its influence is shown to have been thrown in the direction of saving its own temporal interests and augmenting its financial and commercial holdings. The influence of "Big Business" in the Diaz administration and other later political happenings are clearly brought out and emphasized, as well as the struggle of the Mexican laborer to win back the land for himself.

David H. Buel.

Mexican Archæology. An introduction to the archæology of the Mexican and Mayan civilizations of pre-Spanish America. By Thomas A. Joyce. xvi and 384 pp. Map, ills., index. $4. P. L. Warner, London, 1914. 8½ x 5½.

Since the purpose of the author has been to present a manual of the relics of the ancient life of Mexico, he has done wisely to refrain, as far as is scientifically honest, from controversial points. He has presented the several inter-

pretations of important features of Aztec and Maya archeology, and preference of one explanation over another is left for the individual judgment of the student. The migration geography of the Aztec is, of course, very obscure in its earlier stages. The more definitely determined track within the area now known as Mexico is to a less, though still great, degree beset with difficulty. Mr. Joyce provides a sketch map of the route. He does well to note that it is the traditional route and, therefore, is not to be taken as a matter of positive determination. The initial point of this line is at Tulan. After a halt at Atlitlalaquian, the course lies nearly south to the head of the lake at Ecatepec, thence along the west shore to Chapultepec and thus to Tenochtitlan. This so well comports with the most consistent argument that it may well be accepted as having a provisional standing until counter arguments have successfully attacked it. The similar question of the original folk movement of the Maya is more in dispute; there is less information and it would be hardihood to attempt to lay out any one theory upon a chart. In the intricate matter of the Aztec-Maya calendar the author has departed from his non-committal plan and proposes a system of synchronization which is as simple as that astronomical problem can be made and is worthy of careful study. WILLIAM CHURCHILL.

CENTRAL AMERICA AND WEST INDIES

Guatemala and the States of Central America. By Charles W. Domville-Fife. 310 pp. Map, ills. J. Pott & Co., New York, 1913. $3. 9 x 6.

With the opening of the Panama Canal and with the possible diversion of the stream of travelers through the new waterway, the countries bordering the route are rendered more accessible and the thoughts of the wanderer and the investor are turned to the consideration of new areas. It will be a surprise to many, on reading this interesting account of the five Central American states, to learn of their recent progress, their spots of modern civilization and especially of their very promising future. Over half the volume is devoted to Guatemala, and the story is so careful a mixture of history, of politics, of geography and of archeology that a well-balanced impression of the republic rewards the reader. The healthful condition of the state is probably a resultant of the administration of the present head of the country, President Cabrera, who has been animated by a desire to improve the land under his domain; and it is questionable whether the eyes of the people are so set on future developments that they could deal properly with an unscrupulous usurper. Accounts of Nicaragua, Costa Rica, Salvador and Honduras follow. The author rises to the highest enthusiasm over the beauty of Nicaragua, the "best garden of the world," and the entire story is a tempting incitement to visit Central America.

ROBERT M. BROWN.

The Panama Canal. By F. J. Haskin. x and 386 pp. Map, ills., index. Doubleday, Page & Co., New York, 1914. $1.35. 8½ x 5½.

A straightforward story of the Panama Canal, well arranged, simply written and full of the information that intelligent readers desire. Col. Goethals read the chapters dealing with the engineering features of the Canal and found them "an accurate and dependable account of the undertaking."

SOUTH AMERICA

Forty Years in Brazil. By Frank Bennett. xxiv and 271 pp. Ills. Mills & Boon, Ltd., London, 1914. 10s. 9 x 6.

So many books on Brazil are patched together from handbooks, newspapers and encyclopedias that it is a great pleasure to see one like this of Mr. Bennett, that is made up from the personal knowledge and experience of the author as a business man in different parts of the country. There are no maps, and the illustrations have no connection with the text, but they are good and are well chosen. It is unfortunate that the author gives no dates; otherwise his book would have some historical value.

At page 250 he repeats an unwarranted old story regarding the Brazilian

poet Gonçalves Dias, who, he says, never put foot upon Brazilian soil after having written his famous "song of the exile." The facts are that the song of the exile was written in 1843, when the young poet was a student at the University of Coimbra. He returned to Brazil and was in the Government employ there for several years, and died in 1864. J. C. BRANNER.

Geological Expedition to Brazil and Chile, 1908-1909. By J. B. Woodworth. 137 pp. Map, ills. *Bull. Mus. of Comparative Zoology, Harvard Coll.*, Vol. 56, No. 1, Geol. Series, Vol. 10. Shaler Mem. Series, No. 1. 8½ x 6½. 1912.

This paper gives the results of an expedition undertaken under the "Shaler Memorial Fund" of the Museum of Comparative Zoology at Harvard, and, as indicated by the title, it is the first paper of the "Shaler Memorial Series."

It seems eminently fitting that the first paper of this series should be done by Professor Woodworth, Shaler's successor at Harvard, and one of his own students, and that the subject of the author's studies should be chiefly glacial geology, a subject in which Shaler was especially interested.

To one acquainted with the history of geological studies in South America, and especially in Brazil, it is interesting to note that the expedition of Professor Woodworth in 1908 followed the track of the famous "Thayer Expedition" that carried Louis Agassiz, Shaler's own teacher, to Brazil in 1865. For Agassiz's visit initiated the work of a colleague of Shaler, Hartt, which work was taken up and is being carried on to this day by Derby and his colleagues.

The chief interest of Professor Woodworth's report centers in his studies of the Permian glaciation of southern Brazil and the conclusions based upon those studies. Though it has long been known that there were evidences of Permian glaciation in southern Brazil, the only information available on the subject up to the time of the field work upon which this paper was based was a note by W. Waagen quoting a letter from Derby that appeared in the *Neues Jahrbuch für Mineralogie, Geologie und Paläontologie* (Vol. 2, 1888, pp. 172-176), and the doubtful reference by I. C. White of his Orleans conglomerate to a glacial origin ("Final Report on Brazilian Coals," p. 51. Rio de Janeiro, 1908).

Professor Woodworth's familiarity with Pleistocene glaciation in North America and his acquaintance with the tillite beds of Massachusetts, as well as his wide experience as a geologist, enabled him to make, in one brief visit, a valuable contribution to what was hitherto known of these interesting Permian glacial deposits on the southern margin of tropical South America.

The most important of the general conclusions given in the report are:

1. The undoubted glacial origin near sea level of the tillite beds of Paraná, and their likeness to similar beds in India, Australia, and South Africa (p. 74).

2. Much of the material did not come from any great distance to the east of the Serra do Mar.

3. The ice seems to have had a local origin (pp. 81-2).

Referring to the subject in its broader bearing, he observes that "glacial deposits in south Brazil, and on the Falkland Islands carry with them the presumption that the boulder beds beneath a Gondwana flora in Argentina are also glacial in origin" (p. 82).

"The south Brazilian field, with its boulder-beds and later Triassic sheets, constitutes a well-defined geological province for which the name Paraná-land is quite appropriate. It is to be presumed that Paraná-land was continuous with land southward over Argentina and thence to the continental island group of the Falklands" (p. 83).

Regarding the theory of former connections with other continents, he says: "In Brazil it is more probable that the sea invaded the state of Paraná from the west. . . . Both in Africa and South America the marine beds of the Permian demand land near sea-level immediately before and after the invasion of the sea" (p. 84).

"Hypotheses which attempt to account for Permian glaciation by a shift

of the earth's axis of rotation have not been called for by any facts which we now possess.''

The report is fully illustrated with line drawings and with beautifully reproduced photographs. Altogether Professor Woodworth's paper is a noteworthy contribution to the geology of Brazil and to the Permian history of the southern hemisphere. J. C. BRANNER.

The River Amazon from its Sources to the Sea. By Paul Fountain. xi and 321 pp. Maps, ills., index. Dodd, Mead & Co., New York, 1914. 9 x 6.

Paul Fountain has been wandering in the Amazon basin, more or less, for over a generation. He loves nature, has made large collections, has traced the Amazon and some of its mighty tributaries from sources to mouth, and this is his second published book. It is well worth while, unique in its way, a depository of descriptions, facts and deductions, based wholly upon his own experiences and with constant striving to tell the simple truth. He evidently feels that he has made the Amazon field his own, begs to differ here and there from von Humboldt, Darwin, Bates and other great authorities and treats some lesser travelers with caustic touch. He makes all topics interesting; and a conscientious writer who has mentally compacted so much of Amazonia cannot help making a book of value.

The Beautiful Rio de Janeiro. By Alured G. Bell. xix and 194 pp. Maps, ills. W. Heinemann, London, 1914. 42s. 11½ x 8½.

To Americans interested in South America and the securing of the South American trade, this book will be of especial interest. The author gives a view of Rio de Janeiro and Brazil, its climate, etc.; its people, customs, buildings, electric power, railroads, press, art, finance, commerce, tariff, industries, politics and government. Beginning on page 132 is discussed the important question ''What is the foreign policy of Brazil?'' Baron do Rio Branco's statement on this subject, given at the third Pan-American Congress before an assembly of eighty representatives of twenty nations, is quoted and is worthy of note. Although the text is good, the illustrations are the feature of the book. There are numerous beautiful pictures in color, the remainder being black and white. There are three maps. WILBUR GREELEY BURROUGHS.

Pacific Shores from Panama. By Ernest Peixotto. xiv and 285 pp. Ills. Charles Scribner's Sons, New York, 1913. $2.50. 9 x 6½.

The political divisions touched upon in this series of travel narratives are Peru, Bolivia, Panama and Guatemala. There is no pretence at offering a contribution to scientific geography, yet all the more on that account this remarkably entertaining volume will stand in a high place in its own class. A great field of education is open for works of travel in which the interest excited by graces of style in treatment will lead to the wider diffusion of information concerning the lands of the world from which cares of business debar many who are eager to learn. In this volume the artist exhibits that mastery of the pen with which we have long been familiar in his handling of the pencil.

WILLIAM CHURCHILL.

Guiana: British, Dutch and French. By James Rodway. 318 pp. Map, ills., index. Charles Scribner's Sons, New York, 1912. $3. 9 x 6.

Beginning with a description of the geography and geology of Guiana, the author next takes up the history of the peoples inhabiting this country. By means of the prehistoric relics now brought to view, it appears that Guiana was first populated by one or more migrating tribes, in the Neolithic stage. From these early races the rather stormy history of Guiana is followed down to recent times. The present governments, educational systems, modes of communication and transportation, etc., are described; also, the life of the peoples, labor difficulties, effect of the climate on various nationalities and the mortality of different races, the fauna and flora, agricultural and natural products, exports,

imports, and a description of the country that will be of use to travelers. All of these subjects are treated fully.

In connection with the effect of the climate on the economic development of Guiana, the author says: "It may be safely stated that tropical countries can only be developed by tropical races. The European may direct, but he cannot labor in the field. On the amount of imported labor has always depended the prosperity of Guiana. The most important of the three colonies is that belonging to Great Britain, and it is so because the labor supply is greater than in the other colonies. But the tropical negro is not prolific."

It is to India that Guiana must look for labor, for India is the only place within the tropics where the people are prolific, and to Guiana the people of India are commencing to migrate. The census returns of 1911 show 126,517 East Indians settled in British Guiana, and the future prosperity of the colony is largely dependent upon them.

Page 290: "For the explorer there is a tract of country to the east of the River Corentyne, in Surinam, where possibly unknown tribes of Indians may be found; there are also the Tumac-Humac Mountains on the borders of Brazil to be studied." WILBUR GREELEY BURROUGHS.

AFRICA

Egypt: Ancient Sites and Modern Scenes. By Sir Gaston Maspero. Translated by E. Lee. 330 pp. Ills., index. T. Fisher Unwin, London, 1910. 12s. 6d. 9 x 6.

It is indeed rare that a composite volume such as this, rescued from the oblivion of newspaper articles and the pages of various reviews, is so universally timely and thoroughly good. Although the reader, in the words of the introduction, may not obtain a very deep knowledge of the large subject of Egypt, ancient and modern, from its perusal, he will have very clear and trustworthy notions at least concerning some of its attractive and salient features.

To the average globe tourist, who has not dared to traverse the depths of even Wallis-Budge, supplied him by an enterprising firm controlling most of the excursion routes of the country, Egypt is a country leaving memories of villages steeped in mud, with here and there a budding factory. It is a land of the sun, perhaps conducive to somnolent meditation, where the old poverty is as acute as ever, for in apparently prosperous spots the demands for bakhshish are universal.

On the trip up the river, going aground the first time may be amusing, but if often repeated the Arab vocabulary does not contain bad language enough to meet the occasion. And it is to be feared that a "trip to Egypt" might often be better described as a donkey ride spoiled by the monuments, in a country where deporting the royal mummies seems to be the principal business, and where a tip of a whole piastre apiece marks an era in the career of the hungry denizen of the desert, whose stick falls rhythmically on the back of his unoffending donkey and marks time for his steps.

The inhabitant of the country spends his time dreaming of rich finds of treasure, for if he makes a good sale of curios he spends with a lavish hand in riotous living, and, when the inevitable crisis comes, he allows the government to get him out of the mess, his only comment being, with a shrug of his shoulders: "If the government fails, God will provide."

There is not a country in the world where the inhabitants are so filled with illusions, and this is only natural, for they have been fed on traditions. A superstitious story is the stock in trade of many a camp-fire tale, repeated with surroundings which give the finishing touch to the high sounding moral with which it ends. These stories are based on the acts of ancient supernatural beings, many of whom have been brought down to date, for we find that the gods are neither dead nor in exile, but have simply become the demons of modern times.

From the most ancient days they have been a nation of story-tellers, and the "Arab tale" on p. 194 is a good example of this characteristic of a race which has been brought up on the Arabian Nights.

The book might well be called "A workman and his workshop," for it well describes the author and his ceaseless activity in his chosen field of work, a country of dreams, where even the towns appear more like the silhouettes of the twilight than the tragic realities they are, and where the people seem to think that the venerable temples, which they do not comprehend, are so many quarries instituted by Providence for their benefit.

Maspero has been fortunate in his translator, for she has caught the spirit of his enthusiasm in a remarkable degree. Some of the chapters are notable as literary achievements, and the word-painting of such sections as that on "Denderah" and the descriptions of a "Fog on the Nile" are worthy of more than a passing note. .The book is not intended as an exhaustive treatise on Egypt, but it has a distinct value and reason for its existence, in that it gives, with high literary value, an account of the experiences of a master mind.

WILLIAM LIBBEY.

Black Ivory and White, or the Story of El Zubeir Pasha, Slaver and Sultan, as Told by Himself. Translated and put on record by H. C. Jackson. 118 pp. B. H. Blackwell, Oxford, 1913. 7½ x 5.

Anyone who was familiar with the big events in the Egyptian Sudan before the rise of the Mahdi, and after he had closed the Sudan to the world, will remember Zubeir Pasha. Of humble origin, he became in time the greatest and most powerful of the Arab slavers and rulers. He conquered and long held, in what is now the Anglo-Egyptian Sudan, a territory as large as France. Later, he was long detained at Gibraltar, where the British Government thought it wise to keep him till it had settled affairs in the Sudan.

This is his own story of his rise to affluence and power as told to the author of the book. It is very interesting as throwing light upon life and doings in the Sudan when Arab slavers did there practically what they pleased. What Zubeir says of his motives and of some of his dealings with native chiefs and with the blacks is probably open to suspicion; but he tells a good story and is the only chronicler of much that he tells.

North Africa and the Desert: Scenes and Moods. By G. E. Woodberry. 364 pp. Charles Scribner's Sons, New York, 1914. $2. 8½ x 6.

This book is an interpretation of the Sahara by a writer of imagination, poetic feeling, sympathy and a rare gift of literary expression. Those who have seen or studied the desert know that this book is not only literature but is also truth. We are edified by the writings of many men of science who have told us of the Sahara; but a far larger public have here an opportunity to be edified and enlightened by word pictures of many phases of the northern part of the Sahara and its inhabitants that are true in color, atmosphere and expression. Dr. Woodberry was formerly professor of comparative literature in Columbia University. Here is a bit from p. 171:

"It was beyond Ourlana that I noticed to the southwest, a mile or two away, three or four detached palms by a lake; their tall stems leaned through the transparent air above a low bank over a liquid, mirror-like belt of quiet water, a perfect oriental scene. It was my first mirage; and two or three times more I saw it that afternoon—the perfect symbol of all the illusion of life. How beautiful it was, how was its beauty enhanced, framed there in the waste world, how after a while it melted away!"

La Rénovation du Maroc. Par Rodolphe van Loo. 217 pp. J. Lebègue & Cie, Brussels, 1912. Fr. 4. 10 x 7.

Throughout the several essays which form this volume runs a central idea which appears in the title. It is the renovation, the regeneration of the Barbary States. In every chapter is the belief that these communities of the southern Mediterranean shore may become great because they have once been great. The author is richly appreciative of the work that France has been doing in Algeria, he foresees the improvement of Morocco under the same system of colonial possession and commercial betterment. The details of the colonial system are carefully reported with reference to the several topics as to which information might properly be expected. The result of his investigations

is an excellent handbook of Morocco, a well-digested collection of important statistics; at the same time the author has produced a work which holds the interest of the reader as he unfolds the story of the means whereby a sympathetic administration seeks to bring into activity the culture of Africa which has long been dormant. WILLIAM CHURCHILL.

La Région du Haut Tell en Tunisie (Le Kef, Téboursouk, Mactar, Thala). Essai de Monographie Géographique. Par C. Monchicourt. xiv and 487 pp. Maps, ills. A. Colin, Paris, 1913. Fr. 12. 10 x 6½.

The word *Tell,* as used by the natives of Tunis, originally denotes a schistous soil which receives a sufficient quantity of rain throughout the year to store up reserves of moisture which insure a continuous and complete development of annuals, cereals, and grass; the geological and topographical properties of the soil being of but secondary importance. The word has become a geographical proper name, and as such it designates the country where the "Tell" soil predominates, and is about synonymous with the "Friguia" of the old geographers, viz., the fertile region of Northwest Africa as opposed to the Sahel and Sahara regions. Thus Friguia-Tell may be characterized as the country of cereals, Sahel as that of the olive tree, and Sahara (which means yellow) as the country without vegetation.

The author distinguishes three subdivisions: the Northern Tell, which promises to become the stronghold of French colonization, owing to the excellence of its soil and the fact that it possesses the port of Bizerta; the Lower Tell, in the neighborhood of Tunis City, less favored climatically, but provided with river bottoms which somewhat compensate for the greater scarcity of rain; and the High Tell, comprising the highest parts of the province of Tunis, of 700 meters average altitude, and which also has sufficient rainfall, owing to its elevation. Its size is about the same as Alsace-Lorraine.

The settlements of this mountainous country show, in a striking way, the influence of political conditions. They avoid the high plains and plateaus and nestle on the slopes, because, in the open country, they would be freely exposed to the attacks of the hostile tribes. The climate is wholesome, rather cold in winter and not too warm in the summer; the rainfall is heavy enough to allow the growth of small forests and make farming a paying occupation, although extreme cold in the higher and drought in the lower parts have caused quite a systematic seasonal migration of the live stock between hill and plain. The soils less fit for agriculture are rich in minerals: iron, zinc, lead, phosphates, which have attracted thither a motley population of Europeans of all nations, so that almost none but the superintendents are French.

The book describes in full the physical, ethnological, industrial, and colonial aspects of this little-known country, and it is illustrated by many special maps and plates. The careful reader will not fail to testify that the author's experiment of "applying to a little-known part of Africa the methods of modern geography" has been entirely successful. M. K. GENTHE.

Tooth of Fire. Being some account of the ancient kingdom of Sennâr. By H. C. Jackson. 106 pp. Map. B. H. Blackwell, Oxford, 1912. 3s. 6d. 7½ x 5.

The ancient city of Sennaar, called by the King of Soba after a woman, "Tooth of Fire," lies about 167 miles to the southward of Khartum. For more than three centuries it was the seat of a large and powerful kingdom, the Sultans of Sennaar holding sway over a territory extending from Suakin to the borders of Darfur, and from Abyssinia to the Third Cataract near Kosha. But in 1820 Ismail Pasha, with the forces of Egypt, swept down upon Sennaar, breaking its power; and in 1885, after a gallant defence, the city was completely destroyed by the Dervishes. All that now remains is a tangle of ruins, amid which hyenas skulk.

The history of Sennaar has been obscured, but the author has made a careful study of the subject and here briefly gives this history, as revealed by his investigations. Still, much room remains for further research, and Mr. Jackson's work serves to point the way to problems as yet unsolved.

WILBUR GREELEY BURROUGHS.

Die Goldgewichte von Asante (Westafrika). Eine ethnologische Studie. Von Rudolf Zeller. 77 pp. Ills. *Beiträge zur Völkerkunde* (Baessler-Inst.), Beiheft III. B. G. Teubner, Leipzig, 1912. Mk. 12. 13½ x 10.

The theme is specific, minute. The author has subjected to close study all the accessible material, every specimen in museum possession of the weights which the Ashantee use in weighing gold. He has followed a spelling worth note: Ashantee, Asante, Asjante, stand at three apices of a triangle of sound within which lies the true pronunciation of the name. The gold weights are but the theme, the story is really a brilliant account of West African culture. It is still more, the volume with its modest title is a great contribution to the history of design. We note here a distinct locus of the swastika,[1] both dextral and sinistral; every such discovery tends to make it more and more clear that this ornament, sometimes, though not always, caught up within a tangle of religion as magic, must have its origin in some primitive need of early man and that the involved explanations over which students of design have had wordy controversy do not really explain. These African artisans have reached considerable skill in modeling, as is shown by their figurines from life filled with vivacity of treatment.

WILLIAM CHURCHILL.

Mission Hydrographique Congo-Oubangui-Sanga, 1910-1911. Rapport d'ensemble de M. H. Roussilhe. Vol. 1: 464 pp. Vol. 2: 319 pp. Maps, ills. É. Larose, Paris, 1913. 11 x 7½.

In 1910 the Governor General of French Equatorial Africa appointed a commission to study the course of the Congo and its affluents in French territory, to the end that this great natural highway, in the heart of the continent, should be regulated so as to yield the best possible service. The specific aim of the commission was to study the situation at Brazzaville, Bangui and Ouesso especially, and to investigate the river conditions from the standpoint of use between these points, including portions of the Congo, Sanga and Ubangi Rivers. The establishment of a port at Brazzaville, at the beginning of the final plunge of the Congo from the central plain to the sea, was the more important function of the commission. Brazzaville is on Stanley Pool, which is the converging point of all lines of the basin, and at this port also transshipment from boat to rail *en route* for the Atlantic seaboard will magnify its importance and justify the best-known devices to facilitate traffic. Nearly 250 pages of the report cover this project, and as no detailed study had been made of the region previously, the commission was under the necessity of providing for every phase of the work. This portion of the report is extensively illustrated with photographs, and especially with maps and plans. As pioneer work it is remarkably complete and for the stretch of river near Brazzaville and Stanley Pool the commission has placed on record profiles, cross-sections, discharge measurements, and current velocities of the river which, while of fundamental value to the projectors of navigation companies to-day, will be of invaluable aid as time passes in determining the changes in the regimen of the river. In addition, the commission has determined the best site for docks and presents plans and outlines for dockage facilities.

The amelioration of the streams above mentioned, the second important assignment, necessitated a detailed journey over the course with full equipment. The history of this work, designated as the campaign of 1910-11, is reported in the form of notes from the journal of the travelers. These notes are somewhat amplified by numbers of joint observations concerning the regions visited and by personal notes. As a whole, this part is only valuable to students who are seeking detailed information concerning these reaches. The information is so scattered and diverse as to be confusing unless diligently studied. The ground covered includes a reconnaissance from Brazzaville to Betu on the Ubangi, triangulation and survey of the portion of the Ubangi between Betu and the Zinga shoals, a reconnaissance from Mossaka to Ouesso on the Sanga and a study of the N'goko tributary of the Sanga to N'goko. The principal and difficult points in these stretches have been known to navigators for some

[1] A symbol, originating in Asia, denoting well-being.

time and comprise the shoals of Zinga in the Ubangi, about fifty miles below Bangui, which during six months of the year have prevented the passage of the larger vessels of the river and necessitated transshipment to reach the up-river ports, the shoals of the Sanga situated between Bali island and the bend of the river immediately above Ouesso, and the shoals of Molundu on the N'goko. This part of the report ends with a complete account of the illness of members of the commission, European and native, prepared by the medical attendant.

The final portion of the report comprises a general summary of the importance of this waterway, projects for continuing the work of the commission and recommendations tending toward the exploitation of the traffic lines. Up to this time the exposition has been strictly confined to the actual facts of investigation; but now the commission, fulfilling the orders of the Governor General, comments on the possibilities of utilization of the river. It recommends an improvement in the carriers on the Congo and the tributaries discussed, better methods of advertising and readjustment of tariffs. Basing an estimate on the actual tonnage of traffic on the Congo and at the larger ports to-day, the commission prints figures for the traffic possibilities of 1920. The revenues from the traffic are supposed to furnish the funds by means of which the actual control of the river will be completed, the course charted and lighthouses and buoys established. In common with many advocates of waterways, there is a tendency in this part of the discussion to be absolutely sure that an improved highway of necessity means an increase in commerce more than commensurate with the outlay.

Altogether, the report is quite complete. Every feature of preparation, work and review is included. The author enters into too much detail even for the general student of waterways, but he has placed upon record many aspects of a large problem and the work is sure to be of value for other pioneers; especially is this true of the first part of the work, which concerns itself with the preparations for carrying out the work, and therefore considers equipment, instruments and methods of procedure. ROBERT M. BROWN.

African Camp Fires. By Stewart E. White. xiii and 378 pp. Ills. Doubleday, Page & Co., Garden City, N. Y., 1913. $1.50. 7½ x 5½.

"What is the use of this killing game?" asked the Babu at Tsavo Station, of Mr. White. "Man should not destroy what man cannot first create."

And to some of the readers of this book, at least, this question of the Babu will not seem amiss, for scattered throughout the greater portion of the work runs an account of the slaughter of gentle, harmless animals, and the desperate bravery with which lions charged upon the hunters while the bullets crashed into their bodies, checking but slightly their onward rush, until at length a lucky shot brought the brave brute down. It must be said to Mr. White's credit, however, that he made it a point never to let a wounded animal escape if it were possible to prevent it. The life and customs of the various African tribes with whom the author came in contact and the regions through which he explored and hunted are admirably described, and the book is well illustrated with photographs.

Geschichtliche und kulturelle Entwickelung unserer Schutzgebiete. Von J. K. Vietor. 144 pp. D. Reimer (E. Vohsen), Berlin, 1913. Mk. 2. 9 x 6.

The short and readable volume is evidently written to enlighten the wider German public about the status and needs of its African possessions. Two-thirds of it are given over to a history of the colonies, which is made palatable by personal reminiscences of the author. In the last part he discusses the necessary ways and methods of a successful colonial policy. In his opinion the race and land problems are the most important of all. The whole welfare of the colony depends on its having a happy and healthy native population settled upon its own soil. The strictest separation of the races is imperative, and the negro must feel that the white is the master race—though not by harsh treatment, the author even objecting to the general application of corporal punishment, which ought to be restricted to certain grave crimes. On the contrary, the superiority of the white man should appear in the fairness of his dealing

with the negro and the quality of his general conduct. The author does not hesitate to call for special penal measures against white persons whose conduct is injurious to the esteem in which the race should be held by the negro, such as flagrant cheating of the natives, drunkenness, etc.

For the division of the land, the author strongly advocates a free soil policy. Mistakes have been made in the past, by granting large tracts to the chartered companies; but enough is left to supply the scanty population with what they need. It is not true that the native is not willing to work when he can earn money by his work: from the moment the natives discovered there was money in raising cocoa, the output of cocoa in Togo, for instance, has wonderfully increased. Plantation culture is necessary only for sisal and tobacco: the former, because the raw product is so cheap that it does not pay to take it to the factory; the latter, because the culture requires a degree of skill not yet found with the native. Even so, the plantations ought to hire the hands with their families, so that they can lead decent lives. Protection against alcohol is also very necessary, as well as against unsuitable reading; for with the spread of literacy the worst trash of the mother country is beginning to be shipped to the colonies as good enough for the natives, so that education is not at all an unmitigated blessing to them. Special credit for the general uplift of the race is given to the missionaries. The author directly traces the superior development of western Togo to the longer establishment of the missions there, while in the eastern part of the colony the missionaries have been at work only ten years. The book is full of interest for anybody studying colonial problems.

MARTHA KRUG GENTHE.

METEOROLOGY AND CLIMATOLOGY

Die meteorologische Ausbildung des Fliegers. Im Auftrage und mit Unterstützung des Kuratoriums der National-Flugspende herausgegeben von Dr. Franz Linke. 70 pp. Maps, ills. R. Oldenbourg, München, 1913. Mk. 1.70. 8½ x 6.

The title of this book would have been surprising a dozen years ago. Yet to-day the subject and the title seem normal, almost commonplace, so rapid has been the progress of air-navigation, and so keen has been the appreciation of the intimate relations between meteorology and all that relates to traveling through the air. Dr. Franz Linke has already given us (1911) an excellent little book entitled *Aeronautische Meteorologie,* the first of its kind (see *Bulletin,* Vol. 44, p. 224), which was a striking and interesting sign of the times. Now comes another volume, of smaller compass, with an even more significant title. The importance of the contributions which meteorology has already made towards the safety and practicability of air-traveling, as well as the lines along which further observation and study are needed, is clearly indicated. The book is of interest to meteorologists, as well as of immediate practical importance to airmen.

R. DEC. WARD.

Wetterkartenatlas. Eine methodisch geordnete Sammlung von Wetterkarten mit erläuterndem Text. Von Prof. Freybe. 2d. ed. 20 plates. 20 pp. text. Gea Verlag, Berlin, 1913(?). Mk. 1. 9 x 9½.

For elementary meteorological instruction in Germany there are already available excellent text-books, guides in laboratory exercises, and Börnstein's admirable set of enlarged typical weather maps, for wall use. Professor Freybe, who is in charge of the meteorological station at Weilburg, has now prepared a quarto atlas, which is designed to lead to a better understanding of the daily weather maps. The charts are of the same size as the official daily maps, have been chosen with great care, and are graded from the simpler to the more complex. Twenty pages of text call attention to the important facts and principles presented on the maps. For laboratory work in the elementary schools such an atlas is a most useful publication.

R. DEC. WARD.

Klima und Leben (Bioklimatologie). Von W. R. Eckardt. (Sammlung Göschen). 83 pp. Index. G. J. Göschen, Leipzig, 1912. 80 pfg. 6 x 4½.

Practical or applied, as distinguished from pure or theoretical, climatology

concerns itself with the relations of the climatic elements to all forms of life—human, animal and plant. Its aim is to discuss the value of the climatic factor in the distribution, characteristics and habits of man, and of the animals and plants upon which his life, directly or indirectly, depends. It deals with such subjects as the control of climate over crops, over industries, and over habitability; with acclimatization; with the relations of climate and health, and with an almost endless series of similar immediately practical problems. The study of these life relations of climate in the most important subject for the climatologist. His discoveries along these lines are his greatest contributions to the advance of science.

This vital and practical aspect of climatology is discussed by Dr. Eckhardt in his excellent little volume, with the sub-title "Bioklimatologie." As far as is possible within the limits of his book, the author has given an admirably clear, systematic and interesting outline of the controls of climate over the development and distribution of plants and animals. He discusses briefly such matters as the plant zones as dependent on climate; the influence of the glacial period upon the distribution of plant life, and the acclimatization of plants and animals. To climate and man about one-third of the book is devoted. Here we find a brief but clear statement of the problem of human acclimatization, and a general account of the climatic controls of agriculture, industry and transportation. The relations of climate and health are also considered, as are the effects of climatic oscillations upon agriculture, transportation and industry. Dr. Eckhardt has given us what we needed: a simple statement of the relations of climate and life from the point of view of a climatologist. R. DEC. WARD.

TEACHING AND METHODOLOGY

Laboratory Exercises in Structural and Historical Geology. A Laboratory Manual Based on Folios of the United States Geological Survey, for Use with Classes in Structural and Historical Geology. By Rollin D. Salisbury and Arthur C. Trowbridge. v and 76 pp. Henry Holt & Co., New York, 1913. 7½ x 5.

A booklet which offers a valuable aid for instruction in geology. The exercises are based entirely on the folios of the United States Geological Survey and they make reference to about two-thirds of the folios now published. There is decided advantage in this limitation to easily available material. The questions are distinguished as elementary and more difficult, thus providing for work of different degrees of advancement.

The questions and directions for study are clear and ample. Exercises 1-6, although occupying nearly one-half the space, are regarded as introductory, pertaining as they do to structural problems. Exercises 7-13 relate to historical geology, each exercise covering one or more of the periods of geological time. The student who works carefully through this manual will not only get a specific acquaintance with principles but will have a valuable knowledge of the areal geology of the United States. Under the plan of study proposed three or four copies of each folio are regarded as enough for a class of twenty-five members. A. P. BRIGHAM.

Asia: A Supplementary Geography. By James Franklin Chamberlain and Arthur Henry Chamberlain. In series: The Continents and Their People. ix and 198 pp. Maps, ills., index. The Macmillan Co., New York, 1913. 55 cents. 7½ x 5.

This little volume suggests certain defects which it is unwise to set before children at their most impressionable age. We may instance this by a single sentence taken from the chapter on Korea at page 189: "It would seem very strange to you to see men carrying live hogs upon their backs, and policemen carrying swords." Such an item must inculcate the priggish doctrine that everything outside our own little parish is outlandish, when every effort should be made to imply the essential solidarity of mankind and to root out the feeling of small superiority. We know of no such moral superiority in timber

when borne by the police as to warrant the impression that a policeman is strange, according to this text, therefore outlandish, therefore ridiculous because he wears a sword in Korea; it is not even peculiar to Korea, for it is the common arm of the police of Europe. And as to the pig—any farm lad will recognize that after due consideration of the innate obstinacy of the pig the readiest method of securing the presence of a pig at any desired spot is to carry the beast rather than attempt to drive him. WILLIAM CHURCHILL.

Industrial Studies. By Nellie B. Allen. United States. 335 pp. Europe. 409 pp. Maps, ills., indexes. Ginn & Co., Boston, 1913. 65 and 80 cents. 7½ x 5.

Although these volumes are not purely geographical, as may be inferred from their title, they nevertheless contain much excellent geography. "... It is through the life of the people that one learns the character of the nation. What the people of the world are doing determines what the world is to-day." In these two statements lies the reason for publishing the books.

In the treatise on the United States, the first five chapters are devoted to the larger physiographic features; in the following twelve chapters the great industries of the country are presented. The volume on Europe, as is necessary in such a brief presentation, includes only a rapid survey of some of the more important industries in each of the countries.

At the close of each chapter topics for special study and questions for review suggest good material for the teacher. The illustrations have been well selected, and, furthermore, considering this type of book, have been well executed. The maps might be improved upon. Unfortunately, physical maps are lacking.

These books can hardly be used as text books, but rather as efficient supplementary readers. Their style is good. Facts are related very vividly and snappily. Dull moments do not occur. EUGENE VAN CLEEF.

The Elementary Geography. Vol. 5: North and Central America and the West Indies. iv and 152 pp. Vol. 6: The Three Southern Continents. vi and 186 pp. Both by F. W. Herbertson. Maps, ills., and index in each. In Series: The Oxford Geographies, edited by A. J. Herbertson. Clarendon Press, Oxford, 1912. 7½ x 5 each.

Vol. 5: This is an attractive volume. Although written from the standpoint of the English schools, and consequently too abbreviated in its account of the United States for use here, yet for a teacher's handbook the volume is excellent. In the presentation of the subject-matter two points are emphasized: first, there is continual reference to maps, and, second, the book follows the better scheme for lower grades of presenting the text through the life of the countries. The seven introductory chapters, which form the preparation for the study of North America, are broad in their scope and particularly suggestive.

Vol. 6: The salient features of South America, Africa, and Australasia are condensed into a small volume of 180 pages. The book follows the plan of the others of the series. The introductory chapters in this volume are in part mathematical, covering the topics of latitude, longitude, time and seasons and in part a discussion of forests and grasslands. Then in turn the author takes up the important divisions of Africa, Australia as a whole, New Zealand and South America with its main divisions. The book could be used to advantage by teachers in American schools who wish to have a concise and carefully arranged summary of the important facts of the southern hemisphere.

ROBERT M. BROWN.

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MICHIGAN BIRD LIFE. By W. B. Barrows. 822 pp. Ills., index. Special Bull., Dept. of Zoology and Physiology, Michigan Agric. College, Lansing, 1912. $1.95. 9½ x 7.

THE CAROLINA MOUNTAINS. By M. W. Morley. viii and 397 pp. Ills., index. Houghton Mifflin Co., New York, 1913. 9 x 6.

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NEW MAPS

EDITED BY THE ASSISTANT EDITOR

For system of listing maps see p. 74 of this volume

MAPS ISSUED BY UNITED STATES GOVERNMENT BUREAUS

U. S. GEOLOGICAL SURVEY

Topographic Sheets

(*Including Combined and Special Topographic Maps*)

Illinois. Macomb Quadrangle. Surveyed in 1912. 1:62,500. 40°30′ - 40°15′ N.; 90°45′ - 90°30′ W. Contour interval 20 ft. Edition of Sept. 1914.

Iowa. Ames Quad. Surveyed in 1912. 1:62,500. 42°15′ - 42°0′ N.; 93°45′ - 93°30′ W. Interval 20 ft. Edit. of Sept. 1914.

Kentucky. Little Muddy Quad. Surveyed in 1911-1912. 1:62,500. 37°15′ - 37°0′ N.; 86°45′ - 86°30′ W. Interval 20 ft. Edit. of Oct. 1914.

Minnesota. Battle Lake Quad. Surveyed in 1911-1912. 1:62,500. 46°30′ - 46°15′ N.; 95°45′ - 95°30′ W. Interval 10 ft. Edit. of Aug. 1914.

Montana. Nyack Quad. Surveyed in 1907 and 1910-1912. 1:125,000. 48°30′ - 48°0′ N.; 114°0′ - 113°30′ W. Interval 100 ft. Edit. of Aug. 1914.

[The northeastern corner of this sheet has already been published as part of the special map of Glacier National Park on the same scale (see under "Montana, (b)," *Bull.,* Vol. 44, 1912, p. 398). The altitudes have been lowered by about 5 ft.]

Ohio. (a) Gambier Quad. Surveyed in 1912. 1:62,500. 40°30′ - 40°15′ N.; 82°30′ - 82°15′ W. Interval 20 ft. Edit. of Oct. 1914.

(b) Roxabell Quad. Surveyed in 1911-12. 1:62,500. 39°30′ - 39°15′ N.; 83°15′ - 83°0′ W. Interval 20 ft. Edit. of Sept. 1914.

Ohio-Kentucky. (a) East Cincinnati Quad. Surveyed in 1898. Culture revised in 1912. 1:62,500. 39°15′ - 39°0′ N.; 84°30′ - 84°15′ W. Interval 20 ft. Edit. of Sept. 1914.

(b) West Cincinnati Quad. Surveyed in 1898. Culture revised in 1912.

1:62,500. 39°15′ - 39°0′ N.; 84°45′ - 84°30′ W. Interval 20 ft. Edit. of Sept. 1914.

[A new edition of these two sheets, first published in 1900, with "culture" revised. Inasmuch as maps of American cities showing the built-up areas are so difficult of access, it is especially helpful to have this important element—although on a somewhat small scale for the student of city geography—kept up to date. This is especially true of a city with so rapid a growth as Cincinnati, a growth which is brought out graphically by comparing these two editions.]

Oregon. Boring Quad. Surveyed in 1911-1912. 1:62,500. 45°30′ - 45°15′ N.; 122°30′ - 122°15′ W. Interval 25 ft. Edit. of Sept. 1914.

Tennessee-North Carolina. Murphy Quad. Surveyed in 1884-1885 and 1892. Partial revision in 1911-1912. 1:125,000. 35°30′ - 35°0′ N.; 84°30′ - 84°0′ W. Interval 100 ft. Edit. of Sept. 1914.

[The third, revised, edition of this sheet, first published in 1886 and revised in 1893. It is designated "reconnaissance map."]

Virginia-Kentucky. Pound Quad. Surveyed in 1912. 1:62,500. 37°15′ - 37°0′ N.; 82°45′ - 82°30′ W. Interval 50 ft. Edit. of Oct. 1914.

[Coextensive with southeastern quarter of the Whitesburg, Ky.-Va., sheet, 1:125,000, first published in 1886, revised in 1892.]

West Virginia. Crawford Quad. Surveyed in 1911-1912. 1:62,500. 39°0′ - 38°45′ N.; 80°30′ - 80°15′ W. Interval 50 ft. Edit. of Oct. 1914.

[Coextensive with the northwestern quarter of the Buckhannon, W. Va., sheet, first published in 1893, revised in 1896.]

Separate Maps

Southern New England. [Base map of] (States of Massachusetts, Rhode Island, and Connecticut). 1:500,000. Compiled in 1914: R. B. Marshall, Chief Geographer, A. F. Hassan, Cartographer. Advance sheet; subject to correction. U. S. Geological Survey, Washington, D. C., [1914].

[See comment below under "Washington."]

United States. [Contour Map of the] United States. Original compilation under the direction of Henry Gannett. 1:2,500,000. 52° - 24° N.; 129° - 65° W. 4 colors. With inset: Alaska. [1:11,000,000]. 3 colors. In 2 sheets. U. S. Geological Survey, Washington, D. C., 1914.

[This is a printing, in the usual two sheets, of the latest edition of the standard contour map of the United States, which was issued for the first time last year in nine sheets (cf. under "United States," May *Bulletin*, Vol. 46, 1914, p. 394). Surface coloring for the water areas and colored state boundaries are added. The recent death of the lamented Henry Gannett brings to mind his important services in the distinctively geographic interpretation of much of the Survey's varied material. The present map is not the least of his contributions to American geography.]

Washington. [Base map of] State of Washington. 1:500,000. 1 color. Compiled in 1914 (R. B. Marshall, Chief Geographer, A. F. Hassan, Cartographer) in cooperation with the State of Washington, Henry Landes, State Geologist. Advance sheet; subject to correction. U. S. Geological Survey, Washington, D. C., [1914].

[This map and that of Massachusetts, Rhode Island and Connecticut listed above belong to the important series of black-and-white outline state maps being issued by the U. S. Geological Survey (the map of Washington exceptionally shows water, glaciers, and county boundaries in blue). The nature of the series and the maps so far published are discussed under "United States" in the September *Bulletin* (Vol. 46, 1914), pp. 713-714. The addition of these four states makes the total of states published to date 25. Since the ruling made at the recent conference in Paris in December, 1913, as to the official name of the International Map of the World, it would seem wiser to abandon on these maps, in the little diagram showing their relation to the larger work, the designation "*Standard* Map of the World on the scale of 1:1,000,000."]

U. S. Coast and Geodetic Survey*

Alaska. Northern Part of Tlevak Strait and Ulloa Channel, Southeast Alaska. 1:40,000. 55°22′ - 55°6′ N.; 133°21′ - 132°47′ W. 1 color. Chart No. 8151. June 1914. Price 50 cts.

[Tlevak Narrows and Sukkwan Strait, included on this chart, have already been published on twice the scale on Chart No. 8153 (see, under "Alaska," *Bull.*, Vol. 46, 1914, pp. 314-315).]

Connecticut-New York. Long Island Sound—Eastern Part. 1:80,000. 41°22′ - 40°53′ N.; 73°8′ - 72°6′ W. 1 color. Chart No. 1212. Aug. 1914. 50 cts.

[Covers roughly the same area as that shown on Chart No. 115 and forms one of a new series of charts to cover Long Island Sound and the south shore of Long Island, of which Nos. 1211 and 1214 have already been listed (see under "Atlantic Coast" and "New York" respectively, *Bull.*, Vol. 45, 1913, p. 75, and Vol. 46, 1914, p. 74) and No. 1215 is listed below under "New York-New Jersey."]

New Jersey-Delaware. Delaware Bay. 1:80,000. 39°26′ - 38°46′ N.; 75°32′ - 74°50′ W. 1 color. Chart No. 1218. May 1914. 50 cts.

[Replaces old Chart No. 124, covering practically the same area.]

New York-New Jersey. Approaches to New York: Fire Island Light to Sea Girt Light. 1:80,000. 40°43′ - 40°8′ N.; 74°9′ - 73°11′ W. 3 colors. Chart No. 1215. Aug. 1914. 50 cts.

[Water above five fathoms is colored blue: this brings out prominently Ambrose Channel, dredged to its new 40 ft. depth and 2,000 ft. width, in comparison with Gedney and Main Channels, whose 30 ft. depth and 900 ft. width seem to doom them to obsolescence as far as navigation by the largest steamships is concerned.]

North and South Carolina. Cape Hatteras to Charleston Light. [1:400,000]. 35°30′ - 32°30′ N.; 80°0′ - 74°55′ W. Chart No. 1110. July 1914. 50 cts.

[Replaces old Chart No. 11, with which it is practically coextensive.]

NORTH AMERICA

Alaska. Map of Mount McKinley Region, Alaska, Showing Routes Followed by the Expeditions of 1906, 1910 and 1912, compiled from maps of U. S. Geological Survey and surveys by Russell W. Porter, 1906, J. H. Cuntz, 1910, Belmore Browne, 1912: Wm. J. Wilson, *del.* [1:760,000]. 64°8′ - 60°52′ N.; 153°8′ - 148°35′ W. 2 colors. Accompanies, facing p. 368, "The Conquest of Mount McKinley" by B. Browne, New York, 1913.

[Map based on Pl. III in Brooks's "Mount McKinley Region" (*U. S. G. S. Prof. Paper 70*, 1911; listed under "Alaska (6)" in *Bull.*, Vol. 43, 1911, p. 795). The contours there used have been interpreted in very creditable hachuring in black. Glaciers are shown in blue and the author's routes in red. In adapting Brooks's map it might have been well to observe the dotted lines there used to represent unsurveyed topography. The topography shown for the first time on the present map includes the valley of the Chulitna River, a right affluent of the Susitna, and the glacier systems to the southeast and northeast of Mt. McKinley, in which latter direction the extension of the Muldrow Glacier from its known snout nearly to the crest of the mountain was established.]

AFRICA

Abyssinia, etc. (a) Les Itinéraires des Explorateurs du S.-O. de l'Éthiopie (entre les lacs et le Baro) par ordre chronologique. 1:3,000,000. 9⅓° - 4° N.; 33° - 39° E. 4 colors.

(b) Carte des langues de l'Éthiopie groupées d'après les affinités ethniques

* Only new charts are listed, not new editions of old charts.

des peuples qui les parlent, par le Dr. George Montandon. 1:4,000,000. 18° - 4° N.; 32° - 44° E. 4 colors.

(c) Carte des religions de l'Éthiopie. 1:7,500,000. 16° - 3° N.; 32° - 44° E.

(d) Routes in South-Western Abyssinia from Plane-table and Prismatic Compass Traverses by George Montandon, M.D. 1910-11. 1:750,000. 9°3′ - 6°30′ N.; 34°28′ - 38°52′ E. 3 colors. With two insets: (1) Plan of Gore. 1:50,000. [8°9′ N. and 35°32′ E.] 2 colors. (2) [Map of northeastern Africa showing Dr. Montandon's route.] 1:12,000,000. 16° N. - 0°; 28° - 52° E. 3 colors.

Accompany, facing respectively pp. 8, 204, 216 and 424, "Au Pays Ghimirra: Récit de mon voyage à travers le Massif éthiopien (1909-1911)" by G. Montandon, *Bull. de la Soc. Neuchateloise de Géogr.*, Vol. 22, 1913, pp. 5-424.

[Maps accompanying an important monograph on the author's expedition to the hitherto little-known southwestern portion of the Ethiopian Plateau draining into Lake Rudolf and the Sobat River. Map (a) shows in color the routes of 29 explorers of the region. Map (b) is a linguistic map of the whole Ethiopian Plateau and the adjoining Erythrean rift-valley. Four linguistic stocks are distinguished: (1) Semitic, (2) Kuchitic, (3) Kamitic, and (4) with negroid characteristics. Subdivisions of each are shown. Map (c) distinguishes between the following religions: (1) Abyssinian Christians, (2) Roman Catholic Christians, (3) Mohammedans, (4) heathens, (5) Falacha (Kamitic Jews). The ethnic boundary of the Gallas is also shown. Map (d) is a detailed route survey which has already been published in the *Geogr. Journ.*, Vol. 40, 1912, No. 4, on which occasion it was commented on (cf., under "Abyssinia," *Bull.*, Vol. 45, 1913, p. 77).]

Morocco. Carte du Maroc d'après les documents les plus récents. 1:2,000,000 136° - 28° N.; 11⅝° W. - ⅓° E. 4 colors. Adolphe Jourdan, Imprimeru Éditeur. Alger, 1912.

[Clear general map of Morocco: drainage in blue, relief in brown shading, roads in red, railroads in black.]

AUSTRALASIA AND OCEANIA

German and Dutch New Guinea. (a) Deutsch-holländisches Grenzgebiet nach den von Mai-Nov. 1910 aufgenommenen Routen von Prof. Dr. Leonhard Schultze Jena, im Nordbereich erweitert durch die holländischen Aufnahmen des Tami und seiner Zuflüsse (Westküste nach holländ. Seekarten, Ostküste nach der des Reichsmarineamts). Unter Leitung von M. Moisel konstruiert und gezeichnet von H. Wehlmann. 1:300,000. 2°30′ - 5°0′ S. 140°30′ - 141°30′ E. 3 colors.

(b) Der Sepik (Kaiserin-Augusta-Strom). [In two parts:]

I. Die Uferlandschaften des bis 1910 bekannten Stromlaufes. Nach den Original Aufnahmen von Prof. Dr. Leonhard Schultze Jena. Unter Leitung von M. Moisel konstruiert und gezeichnet von H. Wehlmann. 1:200,000. 8 colors. [In two sections:] (1) 3°48′ - 4°21′ S.; 143°14′ - 144°34′ E. (2) 3°57′ - 4°24′ S.; 141°54′ - 143°14′ E.

II. Der bisher unbekannte Oberlauf des Stromes. Nach den von Sept. bis Nov. 1910 aufgenommenen Routen von Prof. Dr. Leonhard Schultze Jena. Unter Leitung von M. Moisel konstruiert und gezeichnet von H. Wehlmann. 1:100,000. [In three sheets:] Blatt 1: 3°48′ - 4°21′ S.; 141°20′ - 142°5′ E. 8 colors. Blatt 2: 3°48′ - 4°21′ S.; 140°35′ - 141°20′ E. 9 colors. Blatt 3: 4°20.5′ - 4°53.2′ S.; 140°34.5′ - 140°20.0′ E. 9 colors.

(c) Übersicht über die Kartenblätter der Expedition von Prof. Dr. L. Schultze Jena. 1:1,500,000. 2⅗° - 6° S.; 140½° - 144⅗° E. 1 color.

Accompany: map (a) as Karte 1, map (b I) as Karte 2, maps under (b II) as Karten 3, 4, and 5, and map (c) as "Übersichtskarte," "Forschungen im Innern der Insel Neuguinea" by L. Schultze Jena, *Ergänzungsheft Nr. 11, Mitt. aus den Deutschen Schutzgeb.*, 1914.

[Important maps embodying the results of the German exploring expedition to the western part of German New Guinea and the German-Dutch frontier region in 1910 under the leadership of Professor Schultze, whose toponymic

"Jena" has evidently been acquired subsequent to his ethnographical work in German Southwest Africa, for which he is best known to geographers. Map (a) represents the frontier region from Humboldt Bay on the coast to, and including, the headwaters of the Sepik; relief is in approximate contours in brown. The maps under (b) comprise a detailed hydrographic survey of the Sepik. The physical features of the flood plain of the river are shown in great detail, there being separate symbols for young and old forest, reeds, sand and gravel banks. Relief, where shown (particularly along the headwaters of the river: map II, Blatt 3), is rendered in approximate contours in brown. To this map is attached a transparent sheet on which are marked the compass bearings taken to the various peaks; and several of the maps are embellished with profiles and panoramas. Map (a) is an index map showing the location of the main maps.]

Other Maps Received

NORTH AMERICA

Canada

British Columbia. Gore's map of Victoria, British Columbia. 1 in. to 1,000 ft. (1:12,000). Victoria Electric Blue Print & Map Co., 1912.

New Brunswick. Map showing the sources of water supply of the City of Saint John, N. B., and intervening country. 2 in. to 1 mi. (1:31,680). [Blue print]. The City Engineer, [Saint John, N. B.]. 1914.

United States

Massachusetts. City of Worcester, best and most complete street guide combined with numbered square index. 4 in. to 1 mi. (1:15,840). Published by E. F. Swan, compiled and revised by Samuel H. Pitcher & Co., Worcester, Mass. [1913]. [Gift from the City Engineer, Worcester, Mass.].

Mexico

Nuevo León. Plano de la ciudad de Monterrey, capital del Estado de Nuevo León, mostrando la zona inundada por la poderosa corriente de agua que produjo el gran desastre en los dias 27, 28 y 29 de Agosto último, con expresión de las manzanas ó cuadras arrastradas por la terrible avenida. 1:10,000. [City Engineer], Monterrey, 1909. $1.50.

Mexico. Plano topográfico oficial de la ciudad de Toluca. 1:4,000. Sección de Ingenieros del Estado, Toluca, 1904.

SOUTH AMERICA

Argentina. Plano de la ciudad de Buenos Aires, capital de la República Argentina, con el trazado general de calles. 1:10,000. Confecionado por el Departamento de Obras Públicas de la Municipalidad, Buenos Aires, 1907.

Plano general del Municipio del Rosario de Sta. Fé. 1:15,000. Departamento de Obras Públicas de la Municipalidad, Rosario, [1914].

AFRICA

Natal. Plan of Durban. 1,150 ft. to 1 in. (1:13,800). Borough Engineer, Durban, [1913].

Plan of Pietermaritzburg. 500 ft. to 1 in. (1:6,000). [City Engineer, Pietermaritzburg, 1914].

ASIA

Ceylon. Colombo in 1904-5. 4 chains to 1 in. (1:3,168). [28 sheets]. Surveyor General, Colombo, Ceylon, [1905].

AUSTRALASIA AND OCEANIA

Australia. City of Adelaide. 8 chains to 1 in. (1:6,336). [The City Engineer, Adelaide, 1914].

Brisbane and suburbs, showing streets, railway lines, tramway routes, &c. 20 chains to 1 in. (1:15,840). [The City Engineer, Brisbane, 1914.]

City of Melbourne, compiled for use in City Surveyor's Office. 20 chains to 1 in. (1:15,840). City Surveyor, Melbourne, 1912.

Melbourne and suburbs. 4 in. to 1 mi. (1:15,840). Surveyor-General's Office, Melbourne, 1910.

Sands & McDougall's plan of the city of Perth. 5 chains to 1 in. (1:3,960). [From the City Engineer, Perth].

Map of the city of Sydney, N. S. W. 1:6,336. Department of Lands, Sydney, 1910.

Tasmania. [Plan of Hobart, Tasmania]. 12 chains to 1 in. (1:9,504). [Gift from the City Engineer, Hobart, Tasmania, 1914].

EUROPE

Austria-Hungary. Kogutowicz Budapest székes öváros térképe. Kiadja a Magyar Földrajzi intézet részvénytárság Budapest. [Scale not uniform]. Ara K. 0.50.

Orientàčni plán král. města Plzně. 1:5,000. [9 sheets]. Nákladem obce Plzenské. Nakreslil stavebni úřad obdor II. Veškerà pràva vyhrazena. Reprodukce Unie v Praze. Vydáno v Květnu, 1912.

Podrobná mapa okolí Pražského. 1:75,000. List 1, Slansko; 2, Brandysko; 3, Berounsko; 4, Posázavi. Pomoci Klubu českych turistu vydala obec Pražska. Provedl c. a. k. vojenský zemępisny ústav ve Vidni r. 1912.

Plan des Grossgemeinde Wien. 1:25,000. Inset: Zentrum von Wien, mit Angabe der wichtigsten Gebäude, Sehenswürdigkeiten und Ämter. 1:9,000. Artaria & Co., Wien, 1914. Price K. 3.

Belgium. Anvers, dressé d'après des indications officielles. Hypsos Office [Antwerp], 1913. [Four maps:] (1) 1:30,000. (2) 1:15,000. (3) 1:15,000, including environs. (4) 1:10,000.

Ville de Verviers. 1:5,000. Ingénieur-Directeur des Travaux, Verviers, 1908.

British Isles. The city and suburbs of Belfast, showing the municipal and parliamentary boundaries, reduced from the Ordnance Survey, and corrected to date. [1:10,560 approx.] Published by McCaw, Stevenson & Orr, Ltd., Belfast [1913]. [Gift from the City Engineer, Belfast].

Belfast district. Ordnance Survey of Ireland. 1 in. to 1 mi. (1:63,360). Ordnance Survey, Southampton, 1912. [Gift from the City Engineer, Belfast].

Birmingham. 1:13,500. Cornish Bros., Ltd., Birmingham [1913].

Map of Greater Birmingham. 3 in. to 1 mi. (1:21,120). White & Pike, Ltd., Birmingham [1913]. [Gift from the City Engineer, Birmingham].

Map of the city and county of Bristol (as extended 1904). 4 in. to 1 mi. (1:15,840). Lavars & Co., Bristol [1913]. [Gift from the City Engineer, Bristol].

County Borough of Burnley, also showing the Parliamentary boundary. About 10 in. to 1 mi. (1:6,336). Borough Surveyor, Burnley, 1909.

City of Cardiff. 6 in. to 1 mi. (1:10,560). [City Engineer's Office, Cardiff, 1913].

Map of the city of Glasgow as divided into municipal wards, compiled from actual surveys. 5 in. to 1 mi. (1:12,672). City Engineer, Glasgow, 1912.

Map of the city of Glasgow and the vicinity. 450 ft. to 1 in. (1:5,400). City Engineer, Glasgow, 1913.

Hampshire. Sheets LXV, N. W. and N. E. [forming city of Southampton]. 1:10,560. Ordnance Survey, Southampton, 1908. [Gift from the City Engineer, Southampton].

Plan of the city of Kingston-upon-Hull. 6 in. to 1 mi. (1:10,560). City Engineer, Hull, 1914.

Lancashire. Sheets LX, N. E., and LXI, N. W. [forming city of Preston]. 1:10,560. Ordnance Survey, Southampton, 1910. [Gift from City Engineer, Preston].

City of Liverpool. 6 in. to 1 mi. (1:10,560). City Engineer, Liverpool [1914].

City of Leeds. 6 in. to 1 mi. (1:10,560). [City Engineer's Office, Leeds, 1914].

General plan of the city of London. 400 ft. to 1 in. (1:4,800). [City Engineer, London], 1909.

Reid's new coloured plan of Newcastle-upon-Tyne and Gosforth. 6 in. to 1 mi. (1:10,560). Andrew Reid & Co., Newcastle-upon-Tyne, 1914. [Gift from the City Engineer, Newcastle].

City of Sheffield. 2 in. to 1 mi. (1:31,680). City Engineer, Sheffield, 1914.

City of Sheffield, Plan shewing new wards. 4 in. to 1 mi. (1:15,840). City Surveyor, Sheffield, 1912.

County Borough of Swansea. 7 in. to 1 mi. (1:9,050). Reproduced from the Ordnance Survey. [City Engineer, Swansea, 1913].

Walthamstow Urban district council. 6 in. to 1 mi. (1:10,560). City Engineer, Walthamstow, 1911.

Bulgaria. Plan of Sofia [in Bulgarian]. 1:10,000. [City Engineer, Sofia, 1913].

General plan of Varna [in Bulgarian]. 1:5,000. City Engineer, Varna [1913].

Map of Varna and environs [in Bulgarian]. 1:40,000. [City Engineer, Varna, 1913].

France. Plan de la ville de Bordeaux, par le Service des Plans sous la direction de M. Louis Longueville, géomètre de la ville. 1:25,000. [25 sections]. Gravé et imprimé par M. H. Borda (Maison Goireau), Graveur, Bordeaux, 1911. [Gift from the Mayor, Bordeaux].

Germany. Gross-Reichenberg und Umgebung. 1:6,000. [The City Engineer, Reichenberg, 1913].

Italy. Pianta di Firenze. [1:25,000?]. Francesco Pineider, Editore. Litografia Pineider, Firenze [1913].

The Netherlands. Kaart van Walcheren. 1:50,000. [City Engineer, Middleburg], 1908.

Portugal. Planta da cidade de Faro. 1:2,500. [City Engineer, Faro], 1909.

Spain. Plano de Bilbao. 1:5,000. [Departamento de la Municipalidad, Bilbao, 1913].

Plano de Cartagena. 1:2,000. Ayuntamiento de Cartagena, 1912.

Plano de Palencia, facilitado y revisado por el Ayuntamiento. 1:5,000. A. Martin, Editor, Barcelona [1913].

Plano del proyecto de Ensanche de Palma de Mallorca. 1:5,000. Ayuntamiento de Palma, Palma, 1901.

Plano de Zaragoza. 1:5,000. 3a ed. Publicado con autorización del Excmo. Ayuntamiento [Zaragoza] 1908.

Switzerland. Quartier- und Strassenplan der Stadt Bern. 13. Auflage. 1:6,250. Verlag von G. A. Bäschli in Bern. 1914. [Gift from Direction des Travaux, Bern].

Uebersichtsplan der Stadt Bern. 1:2,000. Katasterbureau der Stadt Bern, Bern, 1911.

Lausanne d'après le plan officiel de 1912. 1:5,000. F. Rouge & Co., Editeurs, Lausanne. [Gift from Direction des Travaux, Lausanne].

Übersichtskarte der Stadt St. Gallen. 1:4,000. Katasterbureau der Stadt St. Gallen, 1907.

AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156TH STREET

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Officers and Councillors for 1914

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BULLETIN

OF THE

AMERICAN GEOGRAPHICAL SOCIETY

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ERRATA

p. 24, line 9 from bottom, read "Omenika"
map facing p. 24, in the source diagram under the title, the blank space south of that marked "Vreeland" should contain the name "Dawson"
p. 39, line 11 from bottom, read "Bloc-Diagramme" and "Castelnau"
p. 52, line 7 from bottom, read "Pettersson"
p. 60, *dele* heading "General"
p. 65, line 1 of entry under Anthropogeography, read "Menschheit"
p. 90, lines 8 and 9, read "a well-earned rest"
p. 131, line 27, read "1904-1912"
p. 147, line 8 from bottom, read "New York State"
p. 152, line 1 of second entry under Turkey in Asia, read "Anatolie"
p. 153, line 1 of first entry under France, read "Sociétés"
p. 160, line 21, read "[Torino]"
p. 214, line 2 of first title, read "Years'"
p. 224, line 1 of first entry under Asia, read "Eine"
p. 224, line 1 of fourth entry above Asia, read "'Buchholz'"
p. 228, line 1 of third entry under Africa, read "M. Delafosse's"
p. 320, line 5 of second entry under Germany, read "Magdeburg"
p. 363, line 1 of first item, read "Jaeger's"
p. 372, line 1 of second entry under Personal, read "Dr. G. D. Fuller"
p. 372, line 2 of fifth entry under Personal, read "University of Iowa"
p. 389, line 11, read "Martinelli, G."
p. 464, line 1 of first entry under South America, read "Macfarlane"
p. 465, line 1 of last entry under Abyssinia, read "Sawicki, L. von"
p. 467, last line, read "Lemberg"
p. 470, line 1 of fourth entry under Antarctic, read "Probleme"
p. 471, line 4, read "Pettersson, O."
p. 472, line 1 of fifth entry under Africa, read "Mission"
p. 522, line 3 above footnote, read "Beuchat"
p. 557, line 11 from bottom, after "... Australia," insert "(first part)"
p. 558, line 4, read "shown"
p. 558, line 10, read "W. N. Beaver"
p. 558, line 17 of item under World, read "remains"
p. 623, fifth entry (Suriname) should be classified under South America
p. 635, line 4, read "*Petermanns Mitt.*"
p. 700, line 1 of last title, read "Der Tropenarzt"
p. 685, line 31, read "Friederichsen"
p. 685, item on "The Nineteenth Congress of German Geographers" should have been signed "E. Van Cleef"
p. 685, line 10 from bottom, read "Dr. Eduard Hahn"
pp. 697 and 698, signatures under first titles should read "James Gordon Steese."
p. 714, line 21, read "follow"
p. 714, line 25, read "railroads"
p. 716, line 15, after "isotherms" insert "are"
p. 716, line 14 from bottom should begin "(marginal ..."
p. 717, line 21, read "offices"
p. 717, line 1 of entry under South America, read "Colombia" and "(Kolumbien)"
p. 770, lines 4 and 25 of first item, read "Philips'"
p. 780, fourth entry should be classified under World and Parts of It
p. 781, line 4 of fourth entry under Asia, read "1.50 Rubles"
p. 782, *dele* first entry under World and Parts of It
p. 783, last line, read "Faris, R. L."
p. 784, eighth entry should be classified under Canada
p. 782, before second entry under Brazil insert side-heading "Chile"
p. 790, line 1 of first entry under Rumania, read "Süddobrudscha"
p. 796, line 9, *dele* parenthesis after "Tch'eng"
p. 797, line 7, read "p. 318"
p. 847, line 1 of second title under Asia, read "nach"
p. 871, last line, read "Österreich-Ungarns"
p. 875, line 9, read *Arboricultural*
p. 878, line 8 from bottom, read "cartographer's"
p. 946, line 3 of second entry under North America, read "45 cts., paper; 60 cts., bound"